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## Inside the *Blackwall* Box: Explaining U.S. Marine Salvage Awards

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*Under U.S. maritime law, a salvor of imperiled maritime property on navigable waters is entitled to a monetary award from the owner. When the salvage service is rendered voluntarily in the absence of a contract, the court determines the salvage award according to six factors enumerated by the Supreme Court in *The Blackwall*, 77 US (10 Wall) 1 (1869). The law, however, does not specify a precise formula or rule for calculating awards on the basis of the Blackwall factors. How do courts turn their findings on the Blackwall factors into salvage awards? This Article addresses this question by examining the reported decisions of U.S. courts in salvage cases from 1799 to 2007. It employs two statistical methods—fractional polynomial regression and regression tree analysis—to make inferences about the mapping from factors to awards implicit in the salvage cases. In addition to presenting the first systematic empirical study of U.S. marine salvage awards, which complements the traditional doctrinal analysis offered by maritime commentators, an important contribution of the Article is that it showcases statistical methods that are well suited to empirical doctrinal analysis but are underutilized in legal scholarship.*

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## I. INTRODUCTION

"It was a dark and stormy night. . . ."

—Edward Bulwer Lytton<sup>1</sup>

About four o'clock on the morning of August 24, 1867, the British ship *Blackwall* was discovered on fire in San Francisco harbor.<sup>2</sup> The officers and crew of the *Blackwall*, who were unable to subdue the fire, abandoned the ship.<sup>3</sup> "Without speedy assistance the total destruction of the ship and cargo was inevitable."<sup>4</sup> The fire department was called.<sup>5</sup> The chief of the department summoned the aid of the steam tug *Goliah*, which was docked at one of the harbor's wharves.<sup>6</sup> The master and crew of the *Goliah* were roused from their beds and immediately repaired to the wharf.<sup>7</sup> About six o'clock, the *Goliah*, with two fire engines and several firemen on board, made fast alongside the burning *Blackwall*.<sup>8</sup> Within half an hour, the fire was extinguished and the *Goliah* was dismissed.<sup>9</sup>

The owner and master of the *Goliah* brought suit against the *Blackwall* in the district court in San Francisco, seeking a salvage award.<sup>10</sup> "Salvage is the compensation allowed to persons by whose assistance a ship or her cargo has been saved, in whole or in part, from impending peril on the sea, or in recovering such property from actual loss, as in cases of shipwreck, derelict, or recapture."<sup>11</sup> Awards for salvage date back to Byzantium,<sup>12</sup> and perhaps earlier.<sup>13</sup>

<sup>1</sup> Edward Bulwer Lytton, *Paul Clifford* 1 (1830).

<sup>2</sup> See *The Blackwall*, 77 US (10 Wall) 1, 2 (1869).

<sup>3</sup> See *id.*

<sup>4</sup> *Id.*

<sup>5</sup> See *id.*

<sup>6</sup> See *The Blackwall*, 77 US (10 Wall) at 2.

<sup>7</sup> See *id.*

<sup>8</sup> See *id.*

<sup>9</sup> See *id.* at 3.

<sup>10</sup> See *The Blackwall*, 77 US (10 Wall) at 4.

<sup>11</sup> See *id.* at 12.

<sup>12</sup> See Walter Ashburner, *The Rhodian Sea-Law* (Clarendon 1909) (translating and discussing salvage provisions under the Byzantine legal code commonly known as the Rhodian Sea Law and dating the code to between 600 and 800 AD).

<sup>13</sup> See Geoffrey Brice, *Maritime Law of Salvage* 5–6 (Sweet & Maxwell 3d ed 1999) ("There is evidence that almost three thousand years ago under the Rhodian maritime code, which was applied in ancient Greece and the Mediterranean, volunteer salvors were held entitled to be rewarded for their services. This principle was adopted in Roman law."). But see Robert D. Benedict, *The Historical Position of the Rhodian Law*,

The district court ordered an award of ten thousand dollars, which was affirmed by the circuit court.<sup>14</sup>

The owners of the *Blackwall* appealed the award to the Supreme Court.<sup>15</sup> In its opinion, the Court famously enumerated six factors that courts traditionally consider in determining a salvage award.<sup>16</sup> They are: (1) the labor expended by the salvors in rendering the salvage service; (2) the promptitude, skill, and energy displayed in rendering the service and saving the property; (3) the value of the property employed by the salvors in rendering the service, and the danger to which such property was exposed; (4) the risk incurred by the salvors in securing the property from the impending peril; (5) the value of the property saved; and (6) the degree of danger from which the property was rescued.<sup>17</sup> Although the Supreme Court agreed with the district court's findings with respect to the facts and circumstances of the salvage operation, and concluded that the award was appropriate for the entire operation, because it was clear that the award reflected the combined services of the *Goliah* and the fire department (who was not a party to the suit), the Court ordered that the amount of the award be halved to five thousand dollars.<sup>18</sup>

It is "black letter law" that the *Blackwall* factors are the "main ingredients" in determining the amount of an award for marine salvage.<sup>19</sup> Courts have discretion in fashioning salvage awards based on their findings with respect to the *Blackwall* factors, subject to a handful of general principles that guide or delimit their discretion.<sup>20</sup> However, "no precise formula has been . . . described for calculating

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<sup>14</sup> Yale L J 223 (1909) (rejecting any Rhodian influence on Roman maritime law with the exception of the principle of general average contribution in cases of jettison).

<sup>15</sup> *The Blackwall*, 77 US (10 Wall) at 4.

<sup>16</sup> See *id.*

<sup>17</sup> See *id.* at 13–14. See also, for example, *Margate Shipping Co v M/V JA Orgeron*, 143 F3d 976, 984 (5th Cir 1998) ("The district court traditionally determines the amount of a salvage award according to the six *Blackwall* factors."); *BV Bureau Wijnsmuller v United States*, 702 F2d 333, 339 (2d Cir 1983) ("The *Blackwall* factors are those traditionally considered by a court when it makes a salvage award.").

<sup>18</sup> *The Blackwall*, 77 US (10 Wall) at 13–14. In the interest of brevity, the factors hereinafter will be abridged as follows: (1) the labor expended by the salvors, (2) the skill displayed by the salvors, (3) the danger to the salvors' property, (4) the risk incurred by the salvors, (5) the value of the property saved, and (6) the danger to the property saved.

<sup>19</sup> *Id.* at 14–15.

<sup>20</sup> *Id.* at 13 ("main ingredients"); *HRM, Inc v S/V Venture VII*, 972 F Supp 92, 96 (D RI 1997) ("black letter law").

<sup>21</sup> See Part II.B.3.

salvage awards” on the basis of the *Blackwall* factors,<sup>21</sup> a fact that courts have lamented.<sup>22</sup>

How do courts turn their findings on the *Blackwall* factors into salvage awards?<sup>23</sup> This Article addresses the question by examining the reported decisions by U.S. courts in salvage cases from the end of the eighteenth century through 2007. It employs two statistical methods—fractional polynomial regression and regression tree analysis—to make inferences about the mapping from factors to awards implicit in the salvage cases.<sup>24</sup> The former method assumes that the mapping is a smooth function and uses a fractional polynomial to approximate the function.<sup>25</sup> The latter method assumes a hierarchical and dichotomous decision process and represents the mapping as a binary decision tree.<sup>26</sup>

<sup>21</sup> *Allseas Maritime, SA v M/V Mimosa*, 812 F2d 243, 246 (5th Cir 1987), *rehg denied*, 820 F2d 129 (5th Cir 1987). See also cases and other sources cited in note 73.

<sup>22</sup> See, for example, *The Maria Josepha*, 16 F Cas 733, 733 (CC D SC 1819) (“Questions of salvage are always questions of the most disagreeable kind. In vain the mind looks for relief in its anxiety to do justice by seeking the aid of fixed rules and principles.”); *The Cherokee*, 31 F 167, 172 (D SC 1887) (“No question seems to perplex judges more than the amount to be awarded in salvage cases. . . . No fixed rule existing, we look to general propositions as a guide.”). Scholars have noted the judicial angst. See, for example, Steven F. Friedell, ed, 3A *Benedict on Admiralty* § 236 (Matthew Bender 2011) [hereinafter *Benedict on Admiralty*] (“There is no set rule or fixed formula by which a salvage award can be determined. Most courts find . . . the determination of the amount of a just and proper award is quite often a very troublesome matter.”).

<sup>23</sup> Certain judges and commentators have been rather cynical about the process, suggesting that salvage awards are at best the result of an “intelligent guess” and at worst “simply picked out of the air.” *The Rescue v The George B. Roberts*, 64 F 139, 140 (E D Pa 1894) (“There is no rule by which the value of the services in such cases can be accurately measured. At best the award must be the result of an intelligent guess.”); Thomas J. Schoenbaum, *Admiralty and Maritime Law* § 16-5 (Thomson Reuters 5th ed 2011) (“All too often . . . salvage awards are simply picked out of the air.”). See also Grant Gilmore and Charles L. Black, *The Law of Admiralty* 563 (Foundation 2d ed 1975) (“Eventually the trial judge will pull an arbitrary figure out of the air.”).

<sup>24</sup> Fractional polynomial regression was introduced by Patrick Royston and Douglas G. Altman, *Regression Using Fractional Polynomials of Continuous Covariates: Parsimonious Parametric Modelling*, 43 *Applied Statistics* 429 (1994). The seminal work on regression tree analysis is Leo Breiman, et al, *Classification and Regression Trees* (Wadsworth 1984).

<sup>25</sup> A fractional polynomial is an extension of a conventional polynomial that allows for non-integer and negative powers. See Patrick Royston and Douglas G. Altman, *Approximating Statistical Functions by Using Fractional Polynomial Regression*, 46 *Statistician* 411, 412 (1997).

<sup>26</sup> A binary decision tree (also known as a dichotomous decision tree) is a decision tree with only binary splits.

Three main conclusions emerge from the empirical analysis. First, the results evidence a positive, statistically significant relationship between the *Blackwall* factors and the magnitude of the salvage award. In other words, the greater is the order or merit of the salvage operation as measured by the *Blackwall* factors, the greater is the amount of the salvage award. This finding is expected; indeed, it would be surprising if the results suggested otherwise. This Article, however, is the first to provide large-sample confirmation of this relationship. In addition, the fractional polynomial regression analysis yields an unexpected result: a power law relationship between the award and the value of the property saved (that is,  $y = ax^k$  for some scaling constant  $a$  and power  $k$ ). This is noteworthy because of the apparent ubiquity of power laws across a wide range of natural and man-made phenomena, spanning diverse fields such as biology, chemistry, computer science, demography, earth and planetary science, economics and finance, and physics.<sup>27</sup>

Second, the results suggest a ranking of the *Blackwall* factors in terms of importance. The three most important factors, in descending order of importance, are the value of the property saved (factor 5) (which is the single most important factor, accounting for half of the variation in the salvage awards), the labor expended by the salvors (factor 1), and the danger to the property saved (factor 6). Indeed, the regression tree analysis results in a tree that classifies cases using only these factors, and in both the fractional polynomial regression analysis and the regression tree analysis these factors account for nearly all of the collective explanatory power of the *Blackwall* factors. The three least important factors are the skill displayed by the salvors (factor 2), the danger to the salvors' property (factor 3), and the risk incurred by the salvors (factor 4). Although these factors consistently form the bottom tier, their order within the bottom tier varies across the results. It is noteworthy that the ranking of the *Blackwall* factors suggested by the empirical analysis is not entirely consistent with the ranking suggested by Erastus Cornelius Benedict, a leading commentator, and endorsed by several courts, including the Court of Appeals for the Second Circuit and the District

<sup>27</sup> See, for example, Yogesh Virkar and Aaron Clauset, *Power-Law Distributions in Binned Empirical Data*, 8 *Annals Applied Statistics* 89 (2014); Michael P.H. Stumpf and Mason A. Porter, *Critical Truths about Power Laws*, 335 *Science* 665 (2012); Xavier Gabaix, *Power Laws in Economics and Finance*, 1 *Ann Rev Econ* 255 (2009); Michael Mitzenmacher, *A Brief History of Generative Models of Power Law and Lognormal Distributions*, 1 *Internet Math* 226 (2004); M.E.J. Newman, *Power Laws, Pareto Distributions and Zip's Law*, 46 *Contemp Physics* 323 (2005).

Court for the Eastern District of Louisiana.<sup>28</sup> The major differences are that the Benedict ranking does not list the value of the property saved (factor 5) as the most important factor, places the risk incurred by the salvors (factor 4) among the three most important factors, and places the labor expended by the salvors (factor 1) among the bottom three factors.<sup>29</sup>

The third main conclusion of the empirical analysis is that the *Blackwall* factors explain approximately two-thirds of the variation in the salvage awards. The remaining third is explained by unobserved heterogeneity—that is, variables other than the *Blackwall* factors, as well as noise. Two potential sources of unobserved heterogeneity—differences across judicial circuits and over time—are explored in the analysis.<sup>30</sup> Considering the myriad of possible sources of unobserved heterogeneity, the explanatory power of the *Blackwall* factors is rather striking.

The specific results and conclusions of the empirical analysis aside, an important contribution of this Article is that it represents the first systematic empirical study of U.S. marine salvage awards. That is to say, it offers the first empirical doctrinal analysis of the law governing salvage awards. Prior legal scholarship on salvage awards generally consists of theoretical articles that focus on the equity or efficiency of salvage law,<sup>31</sup> including with respect to issues such as preventing environmental damage and saving human life.<sup>32</sup>

<sup>28</sup> See *Benedict on Admiralty* at § 237 (cited in note 22); *BV Bureau Wijsmuller*, 702 F2d at 339; *Margate Shipping Co*, 143 F3d at 984–85 (noting that the District Court for the Eastern District of Louisiana adopted the Benedict ranking); *Jackson Marine Corp v M/V Blue Fox*, 1989 WL 38724, at \*3 (ED La 1989). See also notes 78–82 and accompanying text.

<sup>29</sup> More specifically, Benedict reorders the *Blackwall* factors (in descending order of importance) as follows: factor 6, factor 5, factor 4, factor 2, factor 3, and factor 1. See *Benedict on Admiralty* at § 237 (cited in note 22).

<sup>30</sup> See Part IV.A.2.

<sup>31</sup> See, for example, Richard S. Markovits, *Background (Fixed-Cost) Avoidance-Choices, Foreground (Variable-Cost) Avoidance-Choices, and the Economically Efficient Approach for Courts to Take in Marine-Salvage Cases: A Positive Analysis and Related Critique of Landes and Posner's Classic Study*, 59 *Buff L Rev* 57 (2011); M.B.W. Sinclair, *The Cherry Valley Case: How Wrong Can Economists Be about Salvage?*, 31 *Tul Marit L J* 57 (2006); Paul Hallwood and Thomas J. Miceli, *Murky Waters: The Law and Economics of Salvaging Historic Shipwrecks*, 35 *J Legal Stud* 285 (2006); William M. Landes and Richard A. Posner, *Salvors, Finders, Good Samaritans, and Other Rescuers: An Economic Study of Law and Altruism*, 7 *J Legal Stud* 83 (1978); Note, *Calculating and Allocating Salvage Liability*, 99 *Harv L Rev* 1896 (1986).

<sup>32</sup> See, for example, Thomas L. Nummery, Note, *Environmental Salvage Law in the Age of the Tanker*, 20 *Fordham Envtl L Rev* 267 (2009); Jason Parent, *No Duty to Save Lives, No Reward for Rescue: Is That Truly the Current State of International Salvage Law?*, 12 *Ann Surv Intl & Comp L* 87 (2006); Susanne M. Burnstein, Com-

Other articles that touch on the subject of salvage awards address peculiar topics in salvage law, such as piracy rescue and refusing salvage.<sup>33</sup> And although some commentators make empirical statements about salvage awards in their textbook treatments of the subject,<sup>34</sup> these statements are not substantiated with large-sample evidence.<sup>35</sup> Thus, this Article complements the traditional doctrinal analysis offered by other maritime commentators.

Another important contribution of the Article is that it highlights statistical methods that are well suited to empirical doctrinal analysis but are underutilized in legal scholarship. To my knowledge, the Article is the first study in the legal literature to use fractional polynomial regression for empirical doctrinal analysis.<sup>36</sup> Perhaps more important, it is the first to juxtapose fractional polynomial regression and regression tree analysis. A key difference between the two methods is that the former takes a parametric approach and

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ment, *Saving Steel over Souls: The Human Cost of U.S. Salvage Law*, 27 Tul Marit L J 307 (2002); Brian F. Binney, Comment, *Protecting the Environment with Salvage Law: Risks, Rewards, and the 1989 Salvage Convention*, 65 Wash L Rev 639 (1990); Steven F. Friedell, *Compensation and Reward for Saving Life at Sea*, 77 Mich L Rev 1218 (1979).

<sup>33</sup> Geoffrey Christopher Rapp, *Salvage Awards on the Somali Coast: Who Pays for Public and Private Rescue Efforts in Piracy Crises?*, 59 Am U L Rev 1399 (2010); David J. Bederman and Brian D. Spielman, *Refusing Salvage*, 6 Loyola Marit L J 31 (2008).

<sup>34</sup> See, for example, Gerard J. Mangone, *United States Admiralty Law* 215 (Kluwer 1997) (“Awards may run as high as one-third of the value of the marine property saved . . .”); Gilmore and Black, *The Law of Admiralty* at 563 (cited in note 23) (“[T]he award will never be for more than half the value of the property. . . . In fact, except where the property saved is of trifling value, the award of anywhere near 50% would be exceptional. Where large values are involved, no recent case awards more than about 20% . . .”).

<sup>35</sup> Indeed, the only other empirical analysis of U.S. marine salvage awards of which I am aware was conducted by the Court of Appeals for the Fifth Circuit in *Margate Shipping Co v M/V JA Orgeron*, in which the court “compiled a list of the nine largest salvage awards in comparable high-value, high-order cases since the advent of the *Blackwall* rule” in order to inform their opinion that the district court’s award of 12.5 percent was not excessive. *Margate Shipping Co*, 143 F3d at 993–95.

<sup>36</sup> I have found one other study in the legal literature that uses fractional polynomial regression, but it does not use the method for doctrinal analysis. See Chris William Sanchirico, *Progressivity and Potential Income: Measuring the Effect of Changing Work Patterns on Income Tax Progressivity*, 108 Colum L Rev 1551 (2008). A small handful of studies in the legal literature use classification trees (which are closely related to regression trees) for doctrinal analysis. See, for example, Jonathan P. Kastellec, *The Statistical Analysis of Decisions and Legal Rules with Classification Trees*, 7 J Empirical Legal Stud 202 (2010); Barton Beebe, *An Empirical Study of the Multifactor Tests for Trademark Infringement*, 94 Cal L Rev 1581 (2006); Jack F. Williams, *Debunking the Myth Engulfing Article 9 Collateral Dispositions*, 9 Am Bankr Inst L Rev 703 (2001).



assumes a smooth functional mapping from the high-dimensional fact space to the low-dimensional outcome space, whereas the latter takes a nonparametric approach and directly partitions the fact space.<sup>37</sup> Because they take such different approaches, the two methods serve to complement each other and act as mutual robustness checks. In the current study, the two methods yield the same main conclusions, thereby reinforcing each other's results and increasing confidence in the common conclusions.

The remainder of the Article proceeds as follows. Part II provides an overview of U.S. marine salvage law. Part III describes the hand-collected data set of salvage cases. It explains the search methods and coding procedures, and presents summary and descriptive statistics. Part IV contains the empirical analysis. It summarizes the statistical methods and presents and discusses the results. Concluding remarks appear in Part V.

## II. OVERVIEW OF U.S. MARINE SALVAGE LAW

In the United States, marine salvage is governed by principles of general maritime law, which is part of the *jus gentium* (law of nations).<sup>38</sup> The U.S. Constitution grants federal courts original jurisdiction in "all Cases of admiralty and maritime jurisdiction,"<sup>39</sup> including salvage cases.<sup>40</sup> By statute, jurisdiction to adjudicate salvage cases lies exclusively with the federal courts.<sup>41</sup> "Suits for salvage may be *in rem* against the property saved or the proceeds thereof, or *in personam* against the party at whose request and for whose ben-

<sup>37</sup> Kastellec, 7 J Empirical Legal Stud at 210 (cited in note 36).

<sup>38</sup> See, for example, *RMS Titanic, Inc v Haver*, 171 F3d 943, 960–61 (4th Cir 1999); *Sobonis v Steam Tanker Natl Defender*, 298 F Supp 631, 635 (SDNY 1969).

<sup>39</sup> United States Const Art III, § 2.

<sup>40</sup> See, for example, *Houseman v The North Carolina*, 40 US (15 Pet) 40, 48 (1841) ("The points in controversy are, whether salvage is due, and if due, how much? Upon such questions, there can be no doubt of the jurisdiction of a court of admiralty. . . . The admiralty is the only court where such a question can be tried; for what other court, but a court of admiralty, has jurisdiction to try a question of salvage?"); *Treasure Salvors, Inc v Unidentified, Wrecked and Abandoned Sailing Vessel*, 640 F2d 560, 566 (5th Cir 1981) ("Claims arising out of salvage operation—efforts to rescue or recover ships disabled or abandoned at sea or to retrieve their cargo—are, unquestionably, within the admiralty jurisdiction of the federal courts.").

<sup>41</sup> See 28 USC § 1333(1) (2012) ("The district courts shall have original jurisdiction, exclusive of the courts of the States, of . . . [a]ny civil case of admiralty or maritime jurisdiction, saving to suitors in all cases all other remedies to which they are otherwise entitled."); *Benedict on Admiralty* at § 14 (cited at note 22) (explaining that the "saving to suitors" clause of 28 USC §1333(1) does not apply to salvage cases).



efit the salvage service was performed.”<sup>42</sup> An appellate court “will not disturb a salvage award unless it is based on erroneous principles or a misapprehension of the facts or is so grossly excessive or inadequate as to be deemed an abuse of discretion.”<sup>43</sup>

### A. Types of Salvage Services

Salvage services fall into two categories: (1) contract salvage and (2) pure salvage.

**1. Contract Salvage.** Contract salvage occurs when the owner of property enters into an agreement with a salvor to rescue imperiled assets.<sup>44</sup> A salvage contract may be entered into before any emergency or after the property is already in peril.<sup>45</sup> A court may set aside a salvage contract if either party has taken advantage of an emergency to subject the other to grossly unfair terms.<sup>46</sup> However, “if the contract has been fairly entered into, with eyes open to all the facts, and no fraud or compulsion exists, the mere fact that it is a hard bargain, or that the service was attended with greater or less difficulty than was anticipated, will not justify setting it aside.”<sup>47</sup>

<sup>42</sup> *The Sabine*, 101 US (11 Otto) 384, 386 (1879).

<sup>43</sup> *Compania Galeana, SA v Motor Vessel Caribbean Mara*, 565 F2d358, 360 (5th Cir 1978). See also *Oelwerke Teutonia v Erlanger and Galinger*, 248 US 521 (1919) (“Unless there has been some violation of principle or clear mistake, appeals to this Court concerning the amount of the allowance are not encouraged.”); *Benedict on Admiralty* at § 311 (cited in note 22).

<sup>44</sup> See *Benedict on Admiralty* at § 159 (cited in note 22).

<sup>45</sup> See Mangone, *United States Admiralty Law* at 208 (cited in note 34). The most common contract of this sort is the Lloyd’s of London Open Form (LOF), although there is no obligation on any party to utilize this document to form a valid contract. See *id.*

<sup>46</sup> See *id.*; Schoenbaum, *Admiralty and Maritime Law* at § 16-6 (cited in note 23). See also, *Higgins, Inc v The Tri State*, 99 F Supp 694, 698 (S D Fla 1951) (“The courts . . . consistently have declared any right to compensation for salvage forfeited or reduced in amount in cases where salvors have taken advantage or attempted to take advantage of the unfortunate by embezzlement of salvaged property, gross exaggerations of values and dangers, false representations of material matters, or other acts of misconduct.”); *Magnolia Petroleum Co v National Oil Transport Co*, 281 F 336, 340 (S D Tex 1922), *affd as modified* by 286 F 50 (5th Cir 1923) (“[T]his case is ruled by the general principle . . . that there is a clear right in the courts to set aside a salvage agreement, when made on the high seas under compulsion or hardship, morally or otherwise, when such agreement is unconscionable and inequitable . . .”). This cuts both ways—the salvors could extort a favorable agreement, but the party in peril also could conceal the extent of danger or damage to its own advantage. See Gilmore and Black, *The Law of Admiralty* at 579 (cited in note 23).

<sup>47</sup> *The Elfrida*, 172 US 186, 198 (1898). See also *The Thornley*, 98 F 735, 741–42 (5th Cir 1898); *The Lasca*, 133 F 1005, 1007 (SDNY 1904).

**2. Pure Salvage.** Pure salvage is rendered voluntarily in the absence of a contract. Three elements are necessary for a valid pure salvage claim: (a) a marine peril; (b) service voluntarily rendered when not required as an existing duty or from a special contract; and (c) success in whole or in part, or a contribution to such success.<sup>48</sup>

**a. Marine Peril**

Only maritime property can be salvaged.<sup>49</sup> “Historically maritime property has included vessels; property aboard vessels; property thrown overboard or *jetsam*; property found freely floating on the sea or *flotsam*; property on the sea attached to buoys or *ligan*; and property washed up to shore from the sea or *lagan*.”<sup>50</sup> In general,

<sup>48</sup> See, for example, *The Sabine*, 101 US (11 Otto) at 384. Note the difference between salvage and mere towage. See, for example, *The Flottbek*, 118 F 954, 960 (9th Cir 1902) (“There is a marked and clear distinction between a towage and a salvage service. When a tug is called or taken by a sound vessel as a mere means of saving time, or from considerations of convenience, the service is classed as towage; but if the vessel is disabled, and in need of assistance, it is a salvage service.”); *McConochie v Kerr*, 9 F 50, 53 (SDNY 1881) (“A salvage service is a service which is voluntarily rendered to a vessel needing assistance, and is designed to relieve her from some distress or danger either present or to be reasonably apprehended. A towage service is one which is rendered for the mere purpose of expediting her voyage, without reference to any circumstances of danger.”).

<sup>49</sup> See generally, for example, *Cope v Vallette Dry-Dock Co*, 119 US 625 (1887). The saving of life, in contrast to property, does not on its own confer a salvage award. See, for example, *Peninsular & Oriental Steam Nav Co v Overseas Oil Carriers, Inc*, 553 F2d 830, 835–36 (2d Cir 1977) (“[I]t seems to have been admiralty law that rescuing lives at sea, rather than property, merited moral approbation, but no pecuniary reward.”); *The Plymouth Rock*, 9 F 413, 418 (SDNY 1881) (“[B]y the general maritime law . . . the saving of human life, disassociated from the saving of property, is not a subject of salvage compensation . . . ”); *The Emblem*, 8 F Cas 611, 612 (D Me 1840) (stating that a court of admiralty has “no authority to allow a reward merely for the saving of life”); *Benedict on Admiralty* at § 24 (cited in note 22); Schoenbaum, *Admiralty and Maritime Law* at § 16-8 (cited in note 23); Friedell, 77 Mich L Rev at 1222–23 (cited in note 32). Note, however, that masters of vessels are obliged by statute to “render assistance to any individual found at sea in danger of being lost, so far as the master or individual in charge can do so without serious danger to the master’s or individual’s vessel or individuals on board.” 46 USC § 2304(a)(1) (2012). To discourage disregard for human life in favor of saving property in times of emergency, United States law entitles a salvor of human life, who gives aid following an accident giving rise to salvage, to receive a fair share of the salvage award. See 46 USC § 80107(a) (2012). In contrast to the law of salvage, the law of finds applies in cases of lost or abandoned property and usually applies to ancient shipwrecks. See generally, for example, *Benedict on Admiralty* at § 158 (cited in note 22); Schoenbaum, *Admiralty and Maritime Law* at § 16-7 (cited in note 23); Robert Force, *Admiralty and Maritime Law* 156–57 (2004); Mangone, *United States Admiralty Law* at 223–25 (cited in note 34).

<sup>50</sup> Mangone, *United States Admiralty Law* at 213 (cited in note 34).

maritime property can include any property with a nexus to traditional maritime activities.<sup>51</sup>

In addition to a maritime nexus, there must be an element of peril. The peril need not be imminent; it only must be reasonably apprehended.<sup>52</sup> The fact that the peril is later revealed to have been nonexistent or less grave than imagined will not defeat the peril requirement.<sup>53</sup> In one case, for instance, the “peril” was found to have been entirely imagined by the intoxicated master of the distressed ship; the court noted with some amusement that this was sufficient to sustain a salvage claim.<sup>54</sup> Moreover, the peril need not be severe; the degree of peril “can affect the amount of the award, but not the establishment of a salvage service.”<sup>55</sup>

<sup>51</sup> Compare, for example, *Lambros Seaplane Base v The Batory*, 215 F2d 228, 232–33 (2d Cir 1954) (holding that a seaplane which crashed in navigable waters is subject to salvage), with *Provost v Huber*, 594 F2d 717, 719–20 (8th Cir 1979) (holding that a house that broke through the ice during transport across a frozen lake is not subject to salvage on account of lack of nexus with traditional maritime activities).

<sup>52</sup> See *Fort Myers Shell & Dredging Co v Barge NBC 512*, 404 F2d 137, 139 (5th Cir 1968) (“The standard of ‘imminent’ danger . . . is not the test of marine peril. . . . [T]he standard is not whether the peril is imminent, but rather whether it is ‘reasonably to be apprehended.’”), quoting *The Leonie O. Louise*, 4 F2d 699, 700 (5th Cir 1925). See also, for example, *BV Bureau Wijsmuller*, 702 F2d 333, 339 (2d Cir 1983); *Markakis v S/S Volendam*, 486 F Supp 1103, 1106 (SDNY 1980); *Phelan v Minges*, 170 F Supp 826, 828 (D Mass 1959); *The Plymouth Rock*, 9 F 413 at 416; *The Saragossa*, 21 F Cas 425, 426 (SDNY 1867).

<sup>53</sup> See, for example, *Petition of Sun Oil Co*, 342 F Supp 976, 982 (SDNY 1972), *aff’d sub nom*, *Sun Oil Co v Govostes*, 474 F2d 1048 (2d Cir 1973); *The Lowther Castle*, 195 F 604, 607 (D NJ 1912) (“The reasonableness of the apprehension is not to be read in the light of what was subsequently ascertained, but of the circumstances at the time when an immediate judgment had to be formed and executed.”).

<sup>54</sup> See *The Pendragon Castle*, 5 F2d 56, 57–58 (2d Cir 1924) (“The picture presented would not better any one’s opinion of human nature. . . . The undoubted apprehension of danger by the Sapinero’s master, which induced him to cover the North Atlantic with calls for aid, was the result of incompetence on his part. Whether that incompetence resulted from drink or disease, or both, we are not sure, but the man was unduly frightened. . . . His apprehension was apparently that he would fill and sink. . . . The Pendragon Castle did remove the master’s apprehension, and it did render actual service.”).

<sup>55</sup> *Benedict on Admiralty* at § 63 (cited in note 22). See also, for example, *The Neshaminy*, 228 F 285, 288 (3d Cir 1915) (“The degree of danger is immaterial in considering the nature of the service.”); *Williamson v The Alphonso*, 30 F Cas 4, 5 (D Mass 1853) (“It is strongly urged, that both the peril and the service were too slight to bring the case within the technical definition of salvage. But I am not of this opinion. The relief of property from an impending peril of the sea, by the voluntary exertions of those who are under no legal obligation to render assistance, and the consequent ultimate safety of the property, constitute a case of salvage. It may be a case of more or less merit, according to the degree of peril in which the property was, and the danger and difficulty of relieving it. But these circumstances affect the degree of the service, not its nature.”).

**b. Voluntary Service**

The service must be rendered voluntarily and not pursuant to a contract or other legal duty or obligation.<sup>56</sup> Persons who have a legal duty or obligation to work for the preservation of the imperiled property—including, for instance, the master and crew of a vessel and others engaged in a profession that creates such legal duty or obligation (for example, firefighters)—may not be considered voluntary salvors, except in extraordinary circumstances.<sup>57</sup> The voluntariness requirement will not be defeated, however, if the service has been ordered by a third party having control of the salvor's movements.<sup>58</sup> "Moreover, the motive of the salvor is irrelevant; a professional salvor who acts for economic gain is a volunteer as well as a 'good samaritan' salvor."<sup>59</sup> A putative salvor may start operations on an abandoned vessel without prior authorization—with the hope of later reward.<sup>60</sup> However, a salvor may not force its services upon an owner or master of a vessel who refuses assistance.<sup>61</sup>

**c. Success in Whole or in Part**

Salvage awards are granted only where the service results in success, in whole or in part, in rescuing the imperiled property; failed attempts, however valiant, that result in complete loss of the property will not be rewarded.<sup>62</sup> Any person who contributes to a success-

<sup>56</sup> See, for example, *The Clarita and The Clara*, 90 US (23 Wall ) 1, 16–17 (1875); *BV Bureau Wijsmuller*, 702 F2d at 338–39; *Elrod v Luckenbach SS Co*, 62 F Supp 935, 936 (SDNY 1945); *Benedict on Admiralty* at § 68 (cited in note 22).

<sup>57</sup> The eligibility of various individuals is detailed in *Benedict on Admiralty* at §§ 48–62, 69–87 (cited in note 22). See also Schoenbaum, *Admiralty and Maritime Law* at § 16-3 (cited in note 23).

<sup>58</sup> See *Sobonis*, 298 F Supp at 637.

<sup>59</sup> Schoenbaum, *Admiralty and Maritime Law* at § 16-1 (cited in note 23). See also, for example, *BV Bureau Wijsmuller*, 702 F2d at 339 ("Whatever motive impels the true volunteer, be it monetary gain, humanitarian purposes or merely error, it will not detract from the status accorded him by law. Thus professional salvors—who perform their services for monetary gain—may claim salvage awards."), citing *Benedict on Admiralty* at § 68 (cited in note 22); *The Camanche*, 75 US (8 Wall ) 448 (1869).

<sup>60</sup> See Mangone, *United States Admiralty Law* at 209 (cited in note 34); Gilmore and Black, *The Law of Admiralty* at 535–36 (cited in note 23).

<sup>61</sup> See, for example, *Merritt & Chapman Derrick & Wrecking Co v United States*, 274 US 611, 613 (1927); *Thames Shipyard & Repair Co v United States*, 350 F3d 247, 273–74 (1st Cir 2003); *Intl Aircraft Recovery, LLC v Unidentified, Wrecked & Abandoned Aircraft*, 218 F3d 1255, 1262 (11th Cir 2000); *The Indian*, 159 F 20, 25 (5th Cir 1908); *The Choteau*, 9 F 211, 211 (CC E D La 1881); Schoenbaum, *Admiralty and Maritime Law* at § 16-1 (cited in note 23).

<sup>62</sup> See, for example, *The Sabine*, 101 US (11 Otto) at 390 ("Salvors who volunteer go out at their own risk for the chance of earning reward, and if not successful they

ful salvage operation is entitled to receive a portion of the salvage award, even if the person's efforts alone would not have been sufficient to ensure the success of the operation.<sup>63</sup> Salvage awards are apportioned among co-salvors according to the "relative participation and risk" of each salvor.<sup>64</sup>

The actions of a salvor that worsen the position of the salvaged property may reduce the award, preclude it, or result in an award of damages to the salvee.<sup>65</sup> If the salvage is successful, but the operation causes some damage through ordinary negligence, the salvor is liable and the court will reduce the award accordingly; if, however, the salvor causes damage through "gross negligence or willful misconduct," then the court may deny any award or even award affirmative damages.<sup>66</sup> Fraud or other dishonest conduct also may deprive a salvor of an award.<sup>67</sup>

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are entitled to nothing, the rule being that it is success that gives them a title to salvage remuneration."); *The Blackwall*, 77 US (10 Wall) 1, 12 (1869); *Dorothy J v City of New York*, 749 F Supp 2d 50, 62–63 (EDNY 2010); *The Myrtle Tunnel*, 146 F 324, 327 (D SC 1906) ("Success is an essential ingredient, and however meritorious the service, or benevolent the intentions, or arduous the labor, if it is not attended by beneficial results no reward can be given."); *Anderson v The Edam*, 13 F 135, 138 (EDNY 1882); *The Huntsville*, 12 F Cas 996, 1004 (ED SC 1860) ("No matter how daring may be the attempt to save, nor how meritorious the service rendered to the vessel in distress, without success they furnish no claim to reward."); *Benedict on Admiralty* at § 88 (cited in note 22); Force, *Admiralty and Maritime Law* at 156 (cited in note 49).

<sup>63</sup> See, for example, *The Flottbek*, 118 F 954, 958–60 (9th Cir 1902); *The Annie Lord*, 251 F 157, 159 (D Mass 1917) ("It is not necessary, in order to establish a claim to salvage, that the salvor should actually complete the work of saving the property at risk. It is sufficient if he endeavor to do so, and his efforts have a causal relation to the eventual preservation of it."); *The Strathnevis*, 76 F 855, 866 (D Wash 1896) ("To earn salvage, success must crown the efforts of the salvors. But, when a vessel has been actually rescued from a situation of peril, all who have contributed at any stage of the rescuing service are entitled to a share of the reward."); *Benedict on Admiralty* at § 91 (cited in note 22); Gilmore and Black, *The Law of Admiralty* at 536–37 (cited in note 23).

<sup>64</sup> Schoenbaum, *Admiralty and Maritime Law* at § 16-5 (cited in note 23). See, for example, *Jackson Marine Corp v M/V Blue Fox*, 1989 WL 38724 at \*5 (ED La 1989); *The Lydia*, 49 F 666 (EDNY 1892); *Benedict on Admiralty* at § 92 (cited in note 22); Force, *Admiralty and Maritime Law* at 158 (cited in note 49).

<sup>65</sup> See Force, *Admiralty and Maritime Law* at 159–60 (cited in note 49).

<sup>66</sup> See *Basic Boats, Inc v United States*, 352 F Supp 44, 48–49 (ED Va 1972). See also Schoenbaum, *Admiralty and Maritime Law* at § 16-4 (cited in note 23). Note that professional salvors are held to a higher standard of care than nonprofessionals. See Mangone, *United States Admiralty Law* at 219 (cited in note 34).

<sup>67</sup> See Mangone, *United States Admiralty Law* at 218 (cited in note 34). For a detailed exposition of the law of salvor misconduct, see *Benedict on Admiralty* at §§ 98–129 (cited in note 22).

## B. Salvage Awards

**1. *The Blackwall Factors.*** “The *locus classicus* of the elements to be considered by an American Court in determining a salvage award is *The Blackwall*.”<sup>68</sup> In *The Blackwall*, the Supreme Court famously wrote:

Courts of admiralty usually consider the following circumstances as the main ingredients in determining the amount of the reward to be decreed for a salvage service: (1.) The labor expended by the salvors in rendering the salvage service. (2.) The promptitude, skill, and energy displayed in rendering the service and saving the property. (3.) The value of the property employed by the salvors in rendering the service, and the danger to which such property was exposed. (4.) The risk incurred by the salvors in securing the property from the impending peril. (5.) The value of the property saved. (6.) The degree of danger from which the property was rescued.<sup>69</sup>

Since the Court’s decision in 1869, the six *Blackwall* factors “have been considered black letter law in setting salvage awards.”<sup>70</sup> Moreover, as the Court’s use of the word “usually” indicates, federal courts routinely considered the *Blackwall* factors in deciding salvage cases long before the Court’s decision in *The Blackwall*.<sup>71</sup>

**2. *No Precise Formula.*** Although the *Blackwall* factors supply the “main ingredients” in fashioning a salvage award,<sup>72</sup> salvage law does not provide the recipe. Indeed, “no precise formula has been . . . described for calculating salvage awards” on the basis of the *Blackwall* factors.<sup>73</sup> On the contrary, courts have broad discretion in determin-

<sup>68</sup> Brice, *Maritime Law of Salvage* at 164 (cited in note 13).

<sup>69</sup> *The Blackwall*, 77 US (10 Wall) at 13–14.

<sup>70</sup> *HRM, Inc v S/V Venture VII*, 972 F Supp 92, 96 (D RI 1997). In the words of the Court of Appeals for the Ninth Circuit, the *Blackwall* factors “have weathered the storms of the past century.” *St Paul Marine Transport Corp v Cerro Sales Corp*, 505 F2d 1115, 1120 (9th Cir 1974), quoted in *Margate Shipping Co v M/V JA Orgeron*, 143 F3d 976, 984 (5th Cir 1998).

<sup>71</sup> Indeed, the data contain 115 cases that pre-date *The Blackwall*. See Part III.B.

<sup>72</sup> *The Blackwall*, 77 US (10 Wall) at 13.

<sup>73</sup> *Allseas Maritime SA v M/V Mimosa*, 812 F2d 243, 246 (5th Cir 1987) *rehg denied*, 820 F2d 129 (5th Cir 1987). See also, for example, *Mason v The Blaireau*, 6 US (2 Cranch) 240, 267 (1804) (“There is certainly no positive rule, which governs absolutely the rate of salvage.”); *Virden v The Caroline*, 28 F Cas 1219, 1219 (CCD Del 1857) (“There is no rule of law, nor any fixed rule of judicial discretion, by which the compensation can be exactly measured.”); *Virden*, 28 F Cas at 1221 (stating that “there is no certain and definite rule to guide the court”); *RMS Titanic, Inc v*



ing salvage awards based on their findings with respect to the *Blackwall* factors, a fact lamented as early as 1816 by Supreme Court Justice William Johnson:

Questions of salvage are always questions of the most disagreeable kind. In vain the mind looks for relief in its anxiety to do justice by seeking the aid of fixed rules and principles. Such questions are addressed exclusively to discretion, and that discretion must move in a range to which there are no defined limits.<sup>74</sup>

Compounding this anxiety is the tension between offering salvage awards that are sufficient inducement to render aid but not so costly as to encourage those in distress to take unnecessary risks as to avoid salvage.<sup>75</sup>

**3. General Principles.** The law of salvage offers only a handful of general principles to guide courts and place outer limits on their discretion. One key principle, for example, is that courts are bound to apply all of the *Blackwall* factors.<sup>76</sup> However, they may weight or rank the factors as they see fit.<sup>77</sup>

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*Wrecked and Abandoned Vessel*, 742 F Supp 2d 784, 794 (ED Va 2010) (“There is no precise formula for calculating a salvage award.”); *Atlantis Marine Towing, Inc v The M/V Elizabeth*, 346 F Supp 2d 1266, 1271 (SD Fla 2004) (“There is no fixed rule for determining the amount of the salvage award.”); *Atlantis Marine Towing*, 346 F Supp 2d at 1275 (“As indicated above, the Court is mindful that there is no precise mathematical formula to determine the amount of a proper salvage award.”); *New Bedford Marine Rescue, Inc, v Cape Jeweler’s Inc*, 240 F Supp 2d 101, 115 (D Mass 2003) (stating that “there is no precise formula utilized by courts to determine the salvage award”); *Trico Marine Operators, Inc v Dow Chemical Co*, 809 F Supp 440, 441 (ED La 1992) (“There is no precise formula for determining an appropriate salvage award . . . .”); *Markakis v S/S Veendam*, 1981 AMC 2275, 2277 (SDNY 1981) (stating that “there is no fixed formula for computing a salvage award”); *Franklin Sears v SS American Producer*, 1972 AMC 1647, 1654 (ND Cal 1972) (stating that “there is no precise formula for computing salvage”); *Nicholas E Vernicos Shipping Co v United States*, 223 F Supp 116, 120 (SDNY 1963), *modified*, 349 F2d 465 (2d Cir 1965) (“A much more difficult question is the amount of the [salvage] award. . . . There is no precise formula for computation.”); *The Waterloo*, 29 F Cas 399, 402 (SDNY 1830) (“The want of fixed principles of compensation is the source of serious perplexity to courts and of uncertainty to parties in interest.”).

<sup>74</sup> *The Maria Josepha*, 16 F Cas 733, 734 (CC D SC 1819). See also, for example, sources cited note 22.

<sup>75</sup> See, for example, *American Petroleum Co v The Veendam*, 46 F 489, 494–95 (SDNY 1891) (discussing competing interests in striking a balance).

<sup>76</sup> See *Margate Shipping Co*, 143 F3d at 990.

<sup>77</sup> See, for example, Force, *Admiralty and Maritime Law* at 158 (cited in note 49).



In *BV Bureau Wijismuller v United States*, the Court of Appeals for the Second Circuit adopted the following ranking (in descending order of importance): (i) the danger to the property saved (factor 6); (ii) the value of the property saved (factor 5); (iii) the risk incurred by the salvors (factor 4); (iv) the skill displayed by the salvors (factor 2); (v) the danger to the salvors' property (factor 3); and (vi) the labor expended by the salvors (factor 1).<sup>78</sup> This ranking was suggested by a leading commentator,<sup>79</sup> and has since been endorsed by several other courts, including the District Court for the Eastern District of Louisiana.<sup>80</sup> By contrast, the Court of Appeals for the Third Circuit pointed out that various courts and commentators have listed the *Blackwall* factors in different orders and then stated:

The conclusion to be deduced from these facts is that in considering the various ingredients which enter into the amount of salvage to be awarded, there is no special significance to be attached to the order in which they are mentioned. The amount of the award, determined by emphasis being laid sometimes on one ingredient and sometimes on another, "is largely a matter of fact and discretion, which cannot be reduced to precise rules, but depends upon a consideration of all the circumstances of each case." . . . In mentioning the ingredients above we did not intend to declare a rule of law as to which ingredient was entitled to most consideration in any particular case. The order in which they are mentioned is without significance.<sup>81</sup>

In general, there is no consensus on the order of importance of the *Blackwall* factors.<sup>82</sup>

A second key principle is that the amount of the award may not exceed the value of the property saved.<sup>83</sup> For a relatively brief period

<sup>78</sup> *BV Bureau Wijismuller*, 702 F2d at 339.

<sup>79</sup> See *Benedict on Admiralty* at § 237 (cited in note 22).

<sup>80</sup> See *Margate Shipping Co*, 143 F3d at 984–88; *Jackson Marine Corp*, 1989 WL 38724 at \*3. In *Margate*, the Court of Appeals for the Fifth Circuit stated that the value of the property saved (factor 5) is "clearly one of the most important of the *Blackwall* factors" and that when the danger to the property saved (factor 6) is high ("essentially . . . a 100 percent chance of total loss") the value of the property saved "takes on added significance." 143 F3d at 987–88 & n 15.

<sup>81</sup> *Atlantic Refining Co v Merritt & Chapman Derrick & Wrecking Co*, 300 F 901, 907 (3d Cir 1924), quoting *The Connemara*, 108 US 353, 359 (1883), and citing *Peisch v Ware*, 4 US (4 Cranch ) 347, 364 (1808).

<sup>82</sup> 67B Am Jur 2d *Salvage* § 70 (2010).

<sup>83</sup> See, for example, *The Sabine*, 101 US (11 Otto) at 390; *Allseas Maritime*, 812 F2d at 246; *Trico Marine Operators*, 809 F Supp at 441; Schoenbaum, *Admiralty and Maritime Law* at § 16-5 (cited in note 23); Brice, *Maritime Law of Salvage* at 151 (cited in note 13); Gilmore and Black, *The Law of Admiralty* at 563 (cited in note 23).

in the early history of American salvage law, awards were made on the basis of a moiety or other fixed percentage of the value of the property saved in cases of derelict property.<sup>84</sup> In these cases, the principle was self-actualizing. However, “[i]t is now generally agreed that salvage awards should not be made on the basis of a moiety or other fixed percentage.”<sup>85</sup> Nevertheless, courts continue to adhere to the principle that the value of the property saved is the “ceiling for the maximum allowable total award.”<sup>86</sup> Reference to the salvaged value helps courts ensure that the interests of the salvees are protected.<sup>87</sup>

A third, noteworthy principle is that courts do not view salvage awards “merely as pay, on the principle of a *quantum meruit*, or as a remuneration *pro opere et labore*, but as a reward given for perilous services, voluntarily rendered, and as an inducement to seamen and others to embark in such undertakings to save life and property.”<sup>88</sup>

**4. Recent Developments.** In 1992, courts in two cases added a seventh factor to the *Blackwall* list (though each added a different seventh factor). In *Columbus-America Discovery Group v Atlantic Mutual Insurance Co*,<sup>89</sup> the Court of Appeals for the Fourth Circuit added the following factor, to be applied in cases of salvage of historically valuable shipwrecks: “the degree to which the salvors have worked to protect the historical and archeological value of the wreck and items salvaged.”<sup>90</sup> In *Trico Marine Operators, Inc v Dow Chemical Co*,<sup>91</sup> the District Court for the Eastern District of Louisiana added the following factor: the “skill and efforts of the salvors

<sup>84</sup> See *Benedict on Admiralty* at § 258 (cited in note 22). See also, for example, *Mason v Blaireau*, 6 US (2 Cranch) 240 (1804); *Warder v La Belle Creole*, 29 F Cas 15 (D Pa 1792).

<sup>85</sup> *Benedict on Admiralty* at § 240 (cited in note 22). See also, for example, *Sears v SS American Producer*, 1972 AMC 1647, 1654 (N D Cal 1972); *The Egypt*, 17 F 359, 367–68 (ED Va 1883).

<sup>86</sup> *Ocean Servs Towing & Salvage, Inc v Brown*, 810 F Supp 1258, 1264 (SD Fla 1993).

<sup>87</sup> See, for example, *Hennessey v The Versailles*, 11 F Cas 1128, 1131 (D Mass 1853) (stating that the large salvaged value in that situation gave the court the opportunity to offer a large award “without casting a heavy burden upon an amount of property too small to be adequate to bear it”).

<sup>88</sup> *The Blackwall*, 77 US (10 Wall) at 1, 14. See also, for example, *BV Bureau Wijsmuller*, 702 F2d at 338 (2d Cir 1983).

<sup>89</sup> *Columbus-America Discovery Group v Atlantic Mutual Insurance Co*, 974 F2d 450 (4th Cir 1992).

<sup>90</sup> *Id* at 468; see also *RMS Titanic*, 742 F Supp 2d at 794.

<sup>91</sup> *Trico Marine Operators, Inc v Dow Chemical Co*, 809 F Supp 440 (ED La 1992).

in preventing or minimizing damage to the environment."<sup>92</sup> In addition, the court stated in dicta that an exception to the principle that the amount of the award may not exceed the value of the property saved should be made "where the value of the property saved is inadequate to compensate salvors for their efforts in protecting the environment."<sup>93</sup> The Court of Appeals for the Fifth Circuit, however, later stated that "the extra-*Blackwall* environmental protection factor announced in *Trico* . . . has never been endorsed by this court."<sup>94</sup>

### III. DESCRIPTION OF THE DATA

#### A. Search Methods and Coding Procedures

The data comprise 684 pure salvage cases from 1799 to 2007.<sup>95</sup> The cases were identified using a number of search methods. Together, the searches were designed to locate all reported cases from U.S. federal courts decided on or before December 31, 2007, that apply the *Blackwall* factors to determine awards for pure salvage.

The first search methods were "KeyCiting" and "Shepardizing" *The Blackwall* in Westlaw and LexisNexis, respectively. The second search method was performing keyword searches in three databases: Westlaw's Federal Maritime Law-Cases (FMRT-CS); Lexis's Admiralty Cases, Federal and State (MEGA); and American Maritime Cases (AMC), which is available on Westlaw and Lexis.<sup>96</sup> The third search method was consulting the salvage digests in West's federal

<sup>92</sup> Id at 443. A similar factor is listed in Article 13 of the 1989 International Convention on Salvage (which was ratified by the U.S. Senate and came into effect on July 14, 1996). See Schoenbaum, *Admiralty and Maritime Law* at § 16-5 (cited in note 23). As was the case with the 1910 Convention for the Unification of Certain Rules of Law relating to Assistance and Salvage at Sea, however, U.S. courts have largely overlooked or ignored the 1989 Convention, and virtually all salvage cases since 1996 have been decided without applying or even mentioning the 1989 Convention. See Martin Davies, *Whatever Happened to the Salvage Convention 1989?*, 39 J Marit L & Comm 463, 463-64 (2008).

<sup>93</sup> *Trico Marine Operators*, 809 F Supp at 444. Article 14 of the 1989 Salvage Convention provides for "special compensation" for a salvor who prevents or minimizes environmental damage. See Schoenbaum, *Admiralty and Maritime Law* at § 16-5 (cited in note 23). But, again, U.S. courts have largely overlooked or ignored the 1989 Convention. See Davies, 39 J Marit L & Comm at 463-64 (cited in note 92).

<sup>94</sup> *Margate Shipping Co*, 143 F3d at 988-89.

<sup>95</sup> The data are available at the Georgetown Law Dataverse.

<sup>96</sup> Westlaw's FMRT-CS database contains maritime cases from U.S. federal courts. Coverage begins with 1789. Lexis's MEGA database contains maritime cases from U.S. federal and state courts. Coverage for federal courts begins with 1789. The AMC

digest.<sup>97</sup> The fourth search method was consulting the salvage award tables in the quinquennial digests of American Maritime Cases.<sup>98</sup> The fifth search method was consulting leading treatises on admiralty and maritime law.<sup>99</sup> The sixth search method was consulting early American digests and reporters.<sup>100</sup> The final search method was examining each case, however identified, for two purposes: (i) to find additional cases cited therewithin and (ii) to cull cases that, on closer inspection, did not apply the *Blackwall* factors to determine an award for pure salvage.

These searches yielded 881 pure salvage cases from 1779 to 2007.<sup>101</sup> Of these cases, 197 were excluded from the final data set because they were missing either a clear statement of the salvage award or clear findings with respect to one or more of the *Blackwall* factors.<sup>102</sup> Thus, the final data set includes 684 cases from 1799 to 2007.

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database contains significant maritime decisions rendered by U.S. federal and state courts. Coverage begins with 1923.

<sup>97</sup> 57 *West's Federal Practice Digest* (4th ed 1998).

<sup>98</sup> *Five Year Index-Digest of American Maritime Cases* vols 1–17 (1923–2007).

<sup>99</sup> Schoenbaum, *Admiralty and Maritime Law* (cited in note 23); *Benedict on Admiralty* (cited in note 22); Brice, *Maritime Law of Salvage* (cited at note 13); Mangone, *United States Admiralty Law* (cited in note 34); Gilmore and Black, *The Law of Admiralty* (cited at note 23).

<sup>100</sup> Austin Abbott, *Abbott's Cyclopedic Digest of All the Decisions of All the Courts of New York from the Earliest Time to the Year 1900* (1901); Henry B. Brown, *Reports of Admiralty and Revenue Cases, Argued and Determined in the Circuit and District Courts of the United States, for the Western Lake and River Districts* (1876); John S. Newberry, *Reports of Admiralty Cases, Argued and Adjudged in the District Courts of the United States, for the District of Michigan, Northern District of Ohio, Southern District of Ohio, Western District of Pennsylvania, Northern District of Illinois, District of Missouri, and Eastern District of Louisiana, from 1842 to 1857* (1857); Samuel Blatchford and Francis Howland, *Reports of Cases Argued and Determined in the District Court of the United States for the Southern District of New York* (1855); Thomas Bee, *Reports of Cases Adjudged in the District Court of South Carolina* (1810) (includes an appendix that also reports cases from the Admiralty Court of Pennsylvania); Richard Peters, *Admiralty Decisions in the District Court of the United States, for the Pennsylvania District* (1807).

<sup>101</sup> The cases are listed in the Appendix. A case is listed more than once if it makes more than one award.

<sup>102</sup> More specifically, sixty-four cases were excluded because they were missing a clear statement of the salvage award. After excluding these cases, another 133 were excluded because they were missing clear findings with respect to one or more of the *Blackwall* factors. There appears to be no systematic pattern to the missing factors. Among all 881 cases, each factor has a missing rate between 10.3 and 14.0 percent, and among the 817 cases with clear statements of the salvage award, each factor has a missing rate between 6.9 and 9.5 percent.

For each case, the data record the date of the decision,<sup>103</sup> the court,<sup>104</sup> the award (in 1980 U.S. dollars),<sup>105</sup> the court's finding on each *Blackwall* factor, and an indicator for whether the award was determined with reference to a moiety or other fixed percentage.<sup>106</sup> The data also include indicators for whether the case pre-dates *The Blackwall* or post-dates 1992 (the year in which *Columbus-America* and *Trico Marine* were decided)<sup>107</sup> and the federal judicial circuit to which the court belongs.

The *Blackwall* factors (other than the value of the property saved) are coded as binary variables (high = 1 or low = 0), for two reasons. The first reason is that courts routinely characterize salvage operations as "high order" or "low order."<sup>108</sup> The second reason is that binary coding minimizes subjectivity and, therefore, disagreement or error. The value of the property saved is recorded in 1980 U.S. dollars.

The following procedures were followed in coding the cases. After receiving instructions from me, a research assistant read every case and hand coded every variable. In addition, I met regularly with the research assistant to review his progress and discuss any coding issues or questions. Finally, I audited his work by independently reading and shadow coding 15 percent of the cases. Our disagreement rate was zero with respect to the awards and less than 1 percent with respect to the *Blackwall* factors.

## B. Summary and Descriptive Statistics

The 684 cases in the final data set were decided between March 1799 and December 2007. One hundred fifteen cases (16.8 percent) pre-date *The Blackwall* and fifteen cases (2.2 percent) post-date 1992. The remaining 554 cases (81.0 percent) were decided between 1870 and 1992.

<sup>103</sup> The data record the full date (day, month, and year) for 635 cases. For forty-five cases, the data record only the month and year. For four cases, the data record only the year. Most of the date information was collected from the reported decisions. Some date information, however, was collected from other sources with the assistance of a reference librarian at Georgetown Law Library and staff at regional branches of the U.S. National Archives.

<sup>104</sup> The court is the court of final adjudication, and the data record the award and findings of fact as determined by the court of final adjudication.

<sup>105</sup> Adjustments for inflation were made using Tom's Inflation Calculator, available at <http://www.halfhill.com/inflation.html>.

<sup>106</sup> See Part II.B.3.

<sup>107</sup> See Part II.B.4.

<sup>108</sup> See, for example, *Benedict on Admiralty* at § 278 (cited in note 22).

Table 1 displays summary statistics for the seven primary variables (the salvage award and the six *Blackwall* factors). The salvage awards range from \$240 to \$1,866,000, with a mean award of \$74,000. The value of the property saved (factor 5) ranges from \$1,200 to \$42,133,000, with a mean value of \$1,386,000. The labor expended by the salvors (factor 1) and the skill displayed by the salvors (factor 2) were high in 39 percent and 44 percent of the cases, respectively. The danger to the salvors' property (factor 3) and the risk incurred by the salvors (factor 4) were high in 28 percent and 18 percent of the cases, respectively. The danger to the property saved (factor 6) was high in 51 percent of the cases.

Though not shown in Table 1, it is also noteworthy that: (i) the award percentage (the salvage award expressed as a fraction of the value of the property saved) ranges from less than 1 percent to 85 percent, with a mean of 14 percent; and (ii) the salvage award was determined with reference to a moiety or other fixed percentage in 10 percent of the cases. The fact that the award percentage never exceeds 100 percent confirms that courts adhere to the principle that the amount of the award may not exceed the value of the property saved.

Figure 1 presents a scatter plot of the award percentage and the value of the property saved. It shows an "L-shaped" relationship—as

**Table 1. Summary Statistics**

	Variable	Mean	Standard Deviation	Minimum	Maximum
<i>award</i>	Salvage award	74.44	153.35	0.24	1,865.62
<i>factor1</i>	Labor expended by salvors	0.39	0.49	0	1
<i>factor2</i>	Skill displayed by salvors	0.44	0.50	0	1
<i>factor3</i>	Danger to salvors' property	0.27	0.45	0	1
<i>factor4</i>	Risk to salvors	0.18	0.39	0	1
<i>factor5</i>	Value of property saved	1,385.71	2,913.98	1.20	42,133.47
<i>factor6</i>	Danger to property saved	0.51	0.50	0	1

Notes: 684 cases from 1799 to 2007. Variables *award* and *factor5* in thousands of 1980 U.S. dollars.

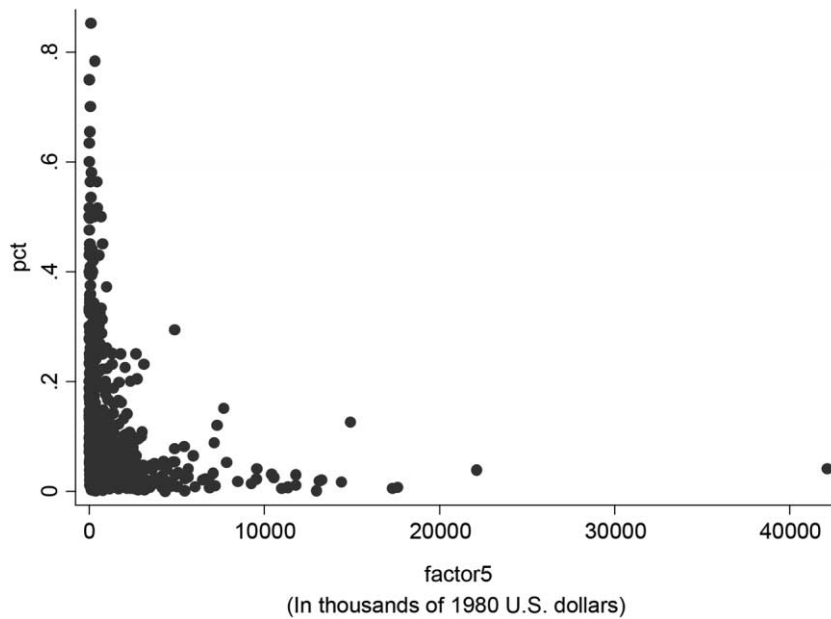


Figure 1. Scatter Plot of Award Percentage and Value of Property Saved

the value of the property saved increases, the maximum award percentage decreases at a decreasing rate. This is the first hint of a power law relationship between the award and value of the property saved. After all, if  $y = ax^k$  with  $a > 0$  and  $k \in (0,1)$ , then  $y/x = ax^{k-1}$  exhibits such an L-shape.

Table 2 displays the mean salvage award conditional on different findings on the *Blackwall* factors. As expected, for each *Blackwall* factor, the mean award when the factor is "low" is smaller than the mean award when the factor is "high," and each pair of conditional means lies on either side of the unconditional mean. For instance, the mean award for cases in which the labor expended by the salvors was low is \$36,000, the mean award for cases in which the labor expended by the salvors was high is \$134,000, and the unconditional mean award for all cases is \$74,000. The patterns displayed in the table evidence a positive relationship between each *Blackwall* factor and the salvage award.

Table 3 presents the correlation matrix for the seven primary variables. Predictably, the value of the property saved (factor 5) and the award are highly correlated (0.60), as are the danger to the salvors' property (factor 3) and the risk incurred by the salvors (factor 4) (0.44). None of the other pairwise correlations is greater than 0.31,



**Table 2. Conditional Salvage Awards**

Variable	Cases	Mean
<i>award</i>	684	74.44
<i>award if factor1 = low</i>	415	35.67
<i>award if factor1 = high</i>	269	134.24
<i>award if factor2 = low</i>	382	51.07
<i>award if factor2 = high</i>	302	103.99
<i>award if factor3 = low</i>	498	57.57
<i>award if factor3 = high</i>	186	119.60
<i>award if factor4 = low</i>	559	58.41
<i>award if factor4 = high</i>	125	146.09
<i>award if factor5 is below average</i>	504	37.98
<i>award if factor5 is above average</i>	180	176.50
<i>award if factor6 = low</i>	337	45.18
<i>award if factor6 = high</i>	347	102.85

Notes: Awards in thousands of 1980 U.S. dollars. For each factor, the difference between the mean conditional awards is significant at the 1 percent level.

and for three factor pairs (factor3-factor5, factor4-factor5, and factor5-factor6) the correlation is not statistically significant.

Table 4 displays the number and frequency of cases for all thirty-two possible combinations of the five dichotomous *Blackwall* factors. The most frequent combination (158 cases or 23.1 percent) has findings of “low” for each factor. The combination with findings of “high” for each factor is fifth most frequent (forty-three cases or 6.3 percent). Of the thirty other possible combinations, fourteen occur in ten or more cases while sixteen occur in fewer than ten cases.

Table 5 breaks down the cases by the federal judicial circuit of the court that decided the case.<sup>109</sup> It also lists the individual courts that decided at least ten cases. Courts in the Second Circuit decided the most cases (236 cases or 34.5 percent), while courts in the

<sup>109</sup> As stated in note 104, this is the court of final adjudication. Of the 684 cases, 545 (79.7 percent) were decided by district courts, 134 (19.6 percent) were decided by circuit courts, and five (0.7 percent) were decided by the Supreme Court.

**Table 3. Correlation Matrix for Primary Variables**

	<i>award</i>	<i>factor1</i>	<i>factor2</i>	<i>factor3</i>	<i>factor4</i>	<i>factor5</i>	<i>factor6</i>
<i>award</i>	1.00						
<i>factor1</i>	0.31 (0.00)	1.00					
<i>factor2</i>	0.17 (0.00)	0.18 (0.00)	1.00				
<i>factor3</i>	0.18 (0.00)	0.25 (0.00)	0.20 (0.00)	1.00			
<i>factor4</i>	0.22 (0.00)	0.29 (0.00)	0.29 (0.00)	0.44 (0.00)	1.00		
<i>factor5</i>	0.60 (0.00)	0.10 (0.01)	0.12 (0.00)	0.01 (0.84)	0.02 (0.64)	1.00	
<i>factor6</i>	0.19 (0.00)	0.18 (0.00)	0.24 (0.00)	0.29 (0.00)	0.22 (0.00)	0.01 (0.74)	1.00

Note: Numbers in parentheses are p-values.

**Table 4. Factor Combinations**

Combination					Cases	Percentage
<i>factor1</i>	<i>factor2</i>	<i>factor3</i>	<i>factor4</i>	<i>factor6</i>		
0	0	0	0	0	158	23.1
1	0	0	0	0	40	5.8
0	1	0	0	0	51	7.5
0	0	1	0	0	9	1.3
0	0	0	1	0	1	0.1
0	0	0	0	1	60	8.8
1	1	0	0	0	22	3.2
1	0	1	0	0	8	1.2
1	0	0	1	0	7	1.0
1	0	0	0	1	36	5.3
0	1	1	0	0	6	0.9

Table 4. (continued)

Combination					Cases	Percentage
<i>factor1</i>	<i>factor2</i>	<i>factor3</i>	<i>factor4</i>	<i>factor6</i>		
0	1	0	1	0	3	0.4
0	1	0	0	1	60	8.8
0	0	1	1	0	5	0.7
0	0	1	0	1	20	2.9
0	0	0	1	1	4	0.6
1	1	1	0	0	10	1.5
1	1	0	1	0	8	1.2
1	1	0	0	1	32	4.7
1	0	1	1	0	1	0.1
1	0	1	0	1	19	2.8
1	0	0	1	1	2	0.3
0	1	1	1	0	2	0.3
0	1	1	0	1	12	1.8
0	1	0	1	1	3	0.4
0	0	1	1	1	4	0.6
1	1	1	1	0	6	0.9
1	1	0	1	1	11	1.6
1	1	1	0	1	16	2.3
1	0	1	1	1	8	1.2
0	1	1	1	1	17	2.5
1	1	1	1	1	43	6.3
Total					684	100.0

Ninth, Eleventh, Fourth, First, and Fifth Circuits decided eighty-seven, eighty-four, seventy-seven, seventy-four, and sixty-two cases, respectively. The remaining sixty-four cases were decided by courts in the other judicial circuits and by the Supreme Court. The two circuit courts that decided the most cases are the Court of Appeals for the Fifth Circuit (twenty-four cases or 3.5 percent) and the Court of Appeals for the Second Circuit (twenty-three cases or 3.4 percent). The five district courts that decided the most cases are the

**Table 5. Courts**

Judicial Circuit	Cases	Percentage
First	74	10.8
Second	236	34.5
Third	34	5.0
Fourth	77	11.3
Fifth	62	9.1
Sixth	10	1.5
Seventh	8	1.2
Ninth	87	12.7
Eleventh	84	12.3
Other judicial circuits	7	1.0
Supreme Court	5	0.7
Total	684	100.0

Court	Cases	Percentage
2d Cir	23	3.4
5th Cir	24	3.5
9th Cir	12	1.8
CC SD NY	11	1.6
D Mass	40	5.8
D Me	14	2.0
D Or	10	1.5
D NJ	11	1.6
D SC	15	2.2
ED La	15	2.2
ED Pa	15	2.2
ED Va	27	3.9
EDNY	81	11.8
ND Cal	20	2.9
SD Fla	53	7.7
SDNY	95	13.9
WD Wash	18	2.6
Other courts	200	29.2
Total	684	100.0

Note: Courts not listed decided fewer than ten cases.

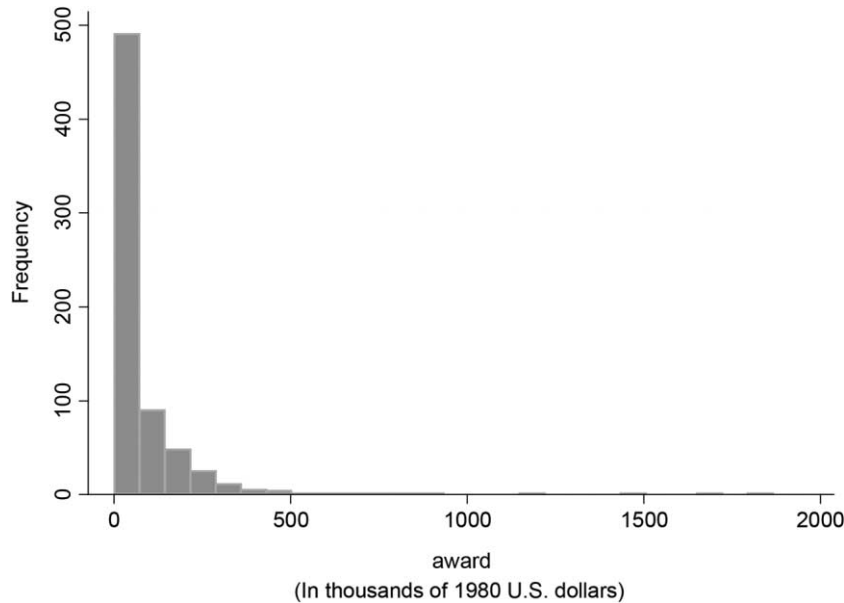


Figure 2. Histogram of Salvage Awards

District Court for the Southern District of New York (ninety-five cases or 13.9 percent), the District Court for the Eastern District of New York (eighty-one cases or 11.8 percent), the District Court for the Southern District of Florida (fifty-three cases or 7.8 percent), the District Court for the District of Massachusetts (forty cases or 5.9 percent), and the District Court for the Eastern District of Virginia (twenty-seven cases or 4.0 percent).

Finally, Figure 2 plots the histogram of the salvage awards. The awards are bounded below by zero and skewed to the right: 72.2 percent of the awards are less than \$74,000 (the mean award), and 98.5 percent are less than \$500,000. Accordingly, the dependent variable in the empirical analysis in Part IV is the natural logarithm of the award. Figure 3 plots the histogram of the log-transformed salvage awards, overlaid with an appropriately scaled normal density.<sup>110</sup> It suggests that the lognormal distribution is a reasonable modeling assumption.

#### IV. EMPIRICAL ANALYSIS

The empirical analysis aims to make inferences about the mapping from *Blackwall* factors to salvage awards implicit in the salvage

<sup>110</sup> The overlaid normal density is appropriately scaled in that it has the same mean and standard deviation as the data.

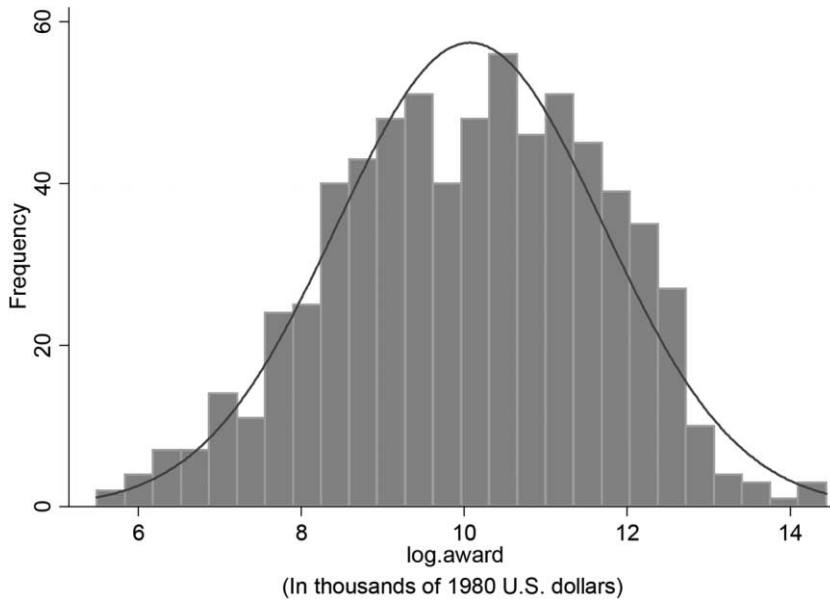


Figure 3. Histogram of Log Awards

cases. Two statistical methods are employed: (i) fractional polynomial regression, which assumes the mapping is a smooth function and uses a fractional polynomial to approximate the function, and (ii) regression tree analysis, which assumes a hierarchical and dichotomous decision process and represents the mapping as a binary decision tree.

### A. Fractional Polynomial Regression Analysis

**1. Methodology.** One way to model how courts map their findings on the *Blackwall* factors into salvage awards is with a function—that is, a correspondence that associates a salvage award with every possible combination of *Blackwall* factors.<sup>111</sup> Formally, let  $X = \{0,1\}^5 \times \mathbb{R}_+$  denote the set of all possible combinations of the *Blackwall* factors and  $Y = \mathbb{R}_+$  denote the set of all possible salvage awards. It is assumed that there exists a function,  $f : X \rightarrow Y$ , which maps each factor combination  $x \in X$  to an award  $y \in Y$ . It is also assumed that  $f$  is smooth (that is, infinitely differentiable).

<sup>111</sup> Modeling judicial decisions and legal rules as functions that map facts to outcomes is a common approach in political science and empirical legal studies.

Fractional polynomial regression is a parametric approach to estimating the unknown function  $f$ .<sup>112</sup> A fractional polynomial is an extension of a conventional polynomial that allows for non-integer and negative powers. In reliance on the Stone-Weierstrass approximation theorem,<sup>113</sup> conventional polynomials are often used to approximate unknown smooth functions. However, conventional polynomial regression generally involves a trade-off between flexibility (that is, fit) and parsimony. Fractional polynomial regression provides a flexible yet parsimonious parametric method for approximating unknown smooth functions.

The standard multivariable fractional polynomial (MFP) regression model may be expressed as

$$y_t = f(x_t; \theta) = b_0 + \sum_{i=1}^h b_i x_{it} + \sum_{i=h+1}^n \sum_{j=1}^m b_{ij} x_{it}^{(p_j)} + \varepsilon_t, \quad t = 1, \dots, T,$$

where  $\theta = (b_0, b_1, \dots, b_h, b_{h+1,1}, \dots, b_{h+1,m}, \dots, b_{n1}, \dots, b_{nm}, \sigma^2)$  is the vector of parameters to be estimated,  $\varepsilon_t \sim N(0, \sigma^2)$  is the independent and identically distributed error term, and the round bracket notation signifies the Box-Tidwell transformation,

$$x_{it}^{(p_j)} = \begin{cases} x_{it}^{(p_j)} & \text{for } p_j \neq 0 \\ \ln x_{it} & \text{for } p_j = 0 \end{cases}.$$

The MFP algorithm selects both the covariates,  $x_1, \dots, x_h, x_{h+1}, \dots, x_n$ , and the powers,  $p_1, \dots, p_m$ , for the continuous covariates. (The first  $h$  covariates,  $x_1, \dots, x_h$ , are categorical, and the remaining covariates,  $x_{h+1}, \dots, x_n$ , are continuous.) The researcher predefines the set of potential covariates; the set of potential powers, denoted  $P$ ; and the maximum degree of the fractional polynomial, denoted  $M$ . The researcher also predefines two significance levels:  $\alpha_1$ , which determines the critical value for covariate selection, and  $\alpha_2$ , which determines the critical value for power selection. The covariates are selected using a backward elimination procedure in which the potential covariates are iteratively removed and added based on a sequence of signifi-

<sup>112</sup> See generally Patrick Royston and Willi Sauerbrei, *Multivariable Model-Building: A Pragmatic Approach to Regression Analysis Based on Fractional Polynomials for Modelling Continuous Variables* (Wiley 2008).

<sup>113</sup> The Stone-Weierstrass approximation theorem states (or, more precisely, implies) that any continuous, real-valued function on a compact subspace of  $\mathbb{R}^n$  can be uniformly approximated by polynomials. See, for example, Robert S. Strichartz, *The Way of Analysis* 399 (Jones & Bartlett rev ed 2000).



cance tests at level  $\alpha_1$ .<sup>114</sup> The powers are selected using a closed test procedure in which an  $M$ -degree fractional polynomial is tested at level  $\alpha_2$  against a linear model and then, if and as necessary, against increasingly complex fractional polynomials.<sup>115</sup> Once the covariates and powers are selected, the parameter vector  $\theta$  is estimated via maximum likelihood.

**2. Results.** In the benchmark MFP regression model, labeled Model 1, the dependent variable is the log-transformed salvage award and the set of covariates comprises the six *Blackwall* factors. In addition, the set of potential powers is  $P = \{-2, -1, 0.5, 0, 0.5, 1, 2, \dots, 5\}$ , and the maximum degree of the fractional polynomial is  $M = 5$ .<sup>116</sup> Finally, the significance level for covariate selection is  $\alpha_1 = 1$  and the significance level for power selection is  $\alpha_2 = 0.05$ . Note that setting  $\alpha_1 = 1$  forces the MFP algorithm to select all the covariates into the model, which is theoretically justified here by the doctrinal principle that courts must apply all of the *Blackwall* factors in determining salvage awards.<sup>117</sup>

Table 6 presents the maximum likelihood estimates for Model 1. It also reports the “visiting order” of the covariates under the MFP algorithm, which signifies the ranking of the covariates in terms of significance.<sup>118</sup> There are four main takeaways from Table 6. First, although the model allows for a fifth-degree fractional polynomial in *factor5* (the one continuous covariate) with powers ranging from  $-2$  to  $5$ , the MFP algorithm selects a simple log transformation (that is, a one-degree fractional polynomial with power zero). This suggests a power law relationship between the award and the value of the property saved; more specifically,  $y = ax^{0.6}$ , where  $y$  is the award,  $x$  is the value of the property saved, and the scale parameter  $a$  depends on the five binary *Blackwall* factors. (Figure 4 illustrates the power law relationship for the modal case, in which every binary factor is low. Figure 5 illustrates that the power law relationship between

<sup>114</sup> See generally Royston and Sauerbrei, *Multivariable Model-Building* at chs 2, 6 (cited in note 112).

<sup>115</sup> See generally id at chs 4, 6. See also Willi Sauerbrei and Patrick Royston, *Building Multivariable Prognostic and Diagnostic Models: Transformation of the Predictors Using Fractional Polynomials*, 162 *J Royal Statistical Society, Series A* 71 (1999); Willi Sauerbrei and Patrick Royston, *Corrigendum: Building Multivariable Prognostic and Diagnostic Models: Transformation of the Predictors Using Fractional Polynomials*, 165 *J Royal Statistical Society, Series A* 399 (2002).

<sup>116</sup> This proves never to be a binding constraint.

<sup>117</sup> See Part II.B.3.

<sup>118</sup> The visiting order of the covariates is determined according to the p-value for omitting each covariate from the model. See Royston and Sauerbrei, *Multivariable Model-Building* at 118 (cited in note 112).

**Table 6. Model 1 – Benchmark MFP Regression**

Variable		Coefficient		Standard Error	Visiting Order
<i>factor1</i>	Labor expended by salvors	0.890	***	0.073	2
<i>factor2</i>	Skill displayed by salvors	0.135	*	0.071	6
<i>factor3</i>	Danger to salvors' property	0.211	***	0.077	5
<i>factor4</i>	Risk incurred by salvors	0.257	***	0.092	4
<i>log.factor5</i>	Value of property saved	0.581	***	0.018	1
<i>factor6</i>	Danger to property saved	0.683	***	0.073	3
Constant		1.804	***	0.216	
Loglikelihood		-898.900			
OLS R <sup>2</sup>		0.697			
Observations		684			

Notes: Dependent variable: *log.award*. Maximum likelihood estimates. White robust standard errors.

\*\*\* Significant at 1 percent level.

\* Significant at 10 percent level.

the award and the value of the property saved implies the L-shaped relationship displayed in Figure 1 between the award percentage and the value of the property saved.) Second, the estimates suggest that each factor is positively related to the salvage award, as well as statistically significant. Third, the visiting order suggests the following ranking of the factors (in descending order): the value of the property saved (factor 5); the labor expended by the salvors (factor 1); the danger to the property saved (factor 6); the risk incurred by the salvors (factor 4); the danger to salvors' property (factor 3); and the skill displayed by the salvors (factor 2). Fourth, the estimates suggest that the model, which includes as covariates only the *Blackwall* factors, explains slightly more than two-thirds of the variation in the salvage awards. Indeed, re-estimating the model with restricted sets of covariates further reveals that (i) the value of the property saved (factor 5) alone explains half of the variation in the awards and (ii) the top three factors (5, 1, and 6) account for nearly all of the collective explanatory power of all six factors.

To check the sensitivity of the benchmark results to the significance level for power selection, the set of potential powers, and the set of covariates, four additional models are estimated. In

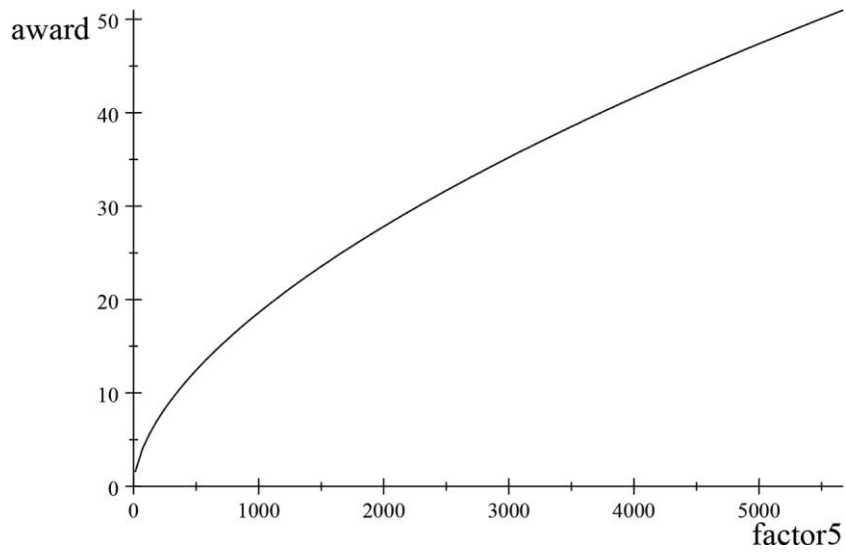


Figure 4. Power Law Relationship (*award* and *factor5* in thousands)

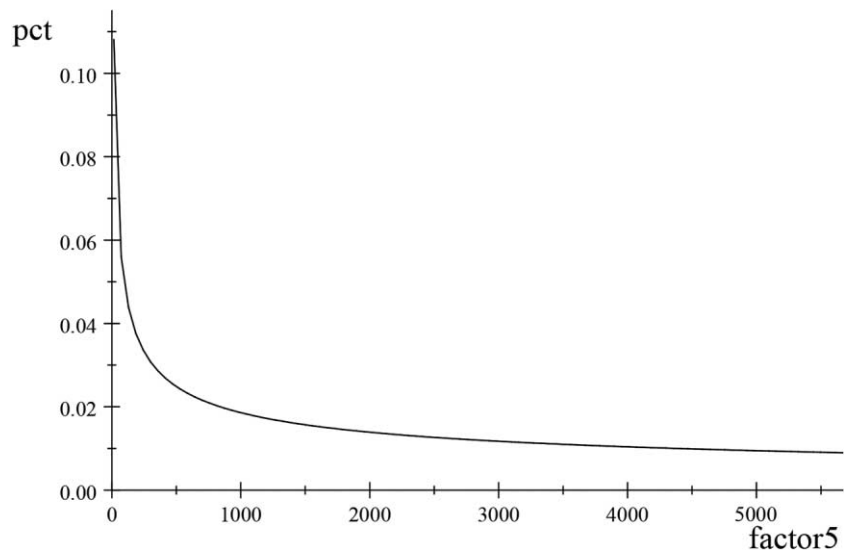


Figure 5. L-Shaped Relationship (*factor5* in thousands)

Models 2 and 3, the significance level for power selection is changed to  $\alpha_2 = 0.01$  and  $\alpha_2 = 0.10$ , respectively. In Model 4, the set of potential powers is expanded to  $P = \{-4, -3, -2, -1, -0.5, 0, 0.5, 1, 2, \dots, 8\}$ . In Model 5, the set of covariates is expanded to include the following controls: an indicator for whether the award was determined with reference to a moiety or other fixed percentage; circuit fixed effects (indicators for the federal judicial circuit of the court); and era fixed effects (indicators for whether the case pre-dates *The Blackwall* or post-dates 1992).

The results for Models 2, 3, and 4 are identical to the benchmark results, suggesting that the MFP regression results are robust to the choice of significance level for power selection and the set of potential powers. Table 7 presents the results for Model 5. It shows that the main takeaways from the benchmark results remain unchanged after including the additional controls, with one exception: the ranking

Table 7. Model 5

Variable		Coefficient		Standard Error	Visiting Order
<i>factor1</i>	Labor expended by salvors	0.791	***	0.070	2
<i>factor2</i>	Skill displayed by salvors	0.183	**	0.073	5
<i>factor3</i>	Danger to salvors' property	0.231	***	0.076	4
<i>factor4</i>	Risk incurred by salvors	0.191	**	0.087	6
<i>log.factor5</i>	Value of property saved	0.593	***	0.018	1
<i>factor6</i>	Danger to property saved	0.642	***	0.069	3
Constant		1.507	***	0.232	
Moiety indicator		Yes			
Circuit fixed effects		Yes			
Era fixed effect		Yes			
Loglikelihood		-864.051			
OLS R <sup>2</sup>		0.701			
Observations		684			

Notes: Dependent variable: *log.award*. Maximum likelihood estimates. White robust standard errors.

\*\*\* Significant at 1 percent level.

\*\* Significant at 5 percent level.

of the bottom three factors. Specifically, in Model 5, the bottom three factors (in descending order) are the danger to the salvors' property (factor 3), the skill displayed by the salvors (factor 2), and the risk incurred by the salvors (factor 4).

As a further robustness check, Models 1 and 5 are re-estimated with standard errors clustered by circuit and year.<sup>119</sup> This allows the error terms (unobserved heterogeneity) to be correlated within circuits across time and across circuits in a given year. Once again, the main takeaways remain unchanged, with one exception: the coefficient for *factor4* (risk to salvors) is no longer statistically significant at common levels. This result is likely due to insufficient independent variation at the circuit level, which in turn is likely due to the relatively small number of cases in which the risk incurred by the salvors was high (125 cases) and the relatively large correlation (0.44) between *factor4* and *factor3* (danger to salvors' property). Indeed, no other (binary) factor was adjudged to be high in so few cases (the next lowest, *factor3*, was high in 186 cases), and no other pair of factors are so highly correlated (the next highest pairwise correlation among the factors is 0.29). When both models are re-estimated again with standard errors clustered by circuit and year but with an alternative variable, *factor3|4*, in place of *factor3* and *factor4*, which indicates whether *factor3* or *factor4* was high, the coefficient on *factor3|4* is statistically significant in both models.

## B. Regression Tree Analysis

**1. Methodology.** An alternative way to model how courts map their findings on the *Blackwall* factors into salvage awards is with a binary decision tree. Regression tree analysis is a nonparametric approach to estimating the tree that best fits the data. Regression tree analysis falls under the umbrella of so-called classification and regression tree analysis (CART).<sup>120</sup> When the outcome variable is

<sup>119</sup> In order to two-way cluster by circuit and year, the estimation uses recently developed multiway clustering methods. See A. Colin Cameron, Jonah B. Gelbach, and Douglas L. Miller, *Robust Inference with Multiway Clustering*, 29 J Bus & Econ Statistics 238 (2011); Samuel B. Thompson, *Simple Formulas for Standard Errors That Cluster by Both Firm and Time*, 99 J Financial Econ 1 (2011). In addition, on account of the small number of federal judicial circuits, the estimation also uses the so-called wild cluster bootstrap-t procedure. See A. Colin Cameron, Jonah B. Gelbach, and Douglas L. Miller, *Bootstrap-based Improvements for Inference with Clustered Errors*, 90 Rev Econ & Statistics 414 (2008).

<sup>120</sup> See generally Breiman, et al, *Classification and Regression Trees* (cited in note 24). See also Brian D. Ripley, *Pattern Recognition and Neural Networks* ch 7 (Cambridge 1996); Clifton D. Sutton, *Classification and Regression Trees, Bagging,*

continuous, CART is referred to as regression tree analysis. When the outcome variable is categorical, CART is referred to as classification tree analysis.<sup>121</sup>

The CART algorithm grows the tree by recursively partitioning the data according to the predictor variables,  $x_1, \dots, x_n$ , to minimize the heterogeneity (“impurity”) of the outcome variable  $y$  in each partition (“node”), subject to four criteria/limitations predefined by the researcher. The first is the measure of impurity. In the case of regression tree analysis, the standard measure is least squares deviation (LSD), which measures within-node variance. Formally, the LSD impurity measure is given by

$$\frac{1}{N(\tau)} \sum_{t \in \tau} [y_t - \bar{y}(\tau)]^2,$$

where  $N(\tau)$  is the number of cases in node  $\tau$ ,  $y_t$  is the outcome in case  $t$ , and  $\bar{y}(\tau)$  is the mean outcome among the cases in node  $\tau$ . The other three criteria or limitations are the minimum improvement in the impurity measure required for a split, the maximum tree depth (levels beneath the root node), and the minimum node size (cases per node). After the tree is grown, it typically is pruned to avoid overfitting. The standard pruning procedure selects the smallest subtree within one standard error of the minimum cost subtree (the subtree with the lowest mean squared error), where cost typically is estimated via tenfold cross-validation.

The following is a sketch of the steps performed by the CART algorithm in constructing the final tree.<sup>122</sup> First, starting with the root node, CART performs all possible splits on each of the predictors and calculates the impurity improvement achieved by each split. Second, it selects the split that achieves the maximum impurity improvement and partitions the data into left and right child nodes. Third, it repeats the first two steps for each of the nonterminal nodes and grows the largest possible tree (subject to the minimum impurity improvement criterion and the maximum tree depth and minimum node size limitations). Once the tree is grown, the mean outcome of the cases in each terminal node becomes the pre-

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and Boosting, in C.R. Rao, E.L. Wegman, and J.L. Solka, eds, *Data Mining and Data Visualization* 330 (Elsevier 2005).

<sup>121</sup> As stated in note 36, a small handful of studies in the legal literature use classification trees to conduct empirical doctrinal analysis.

<sup>122</sup> See Yisehac Yohannes and Patrick Webb, *Classification and Regression Trees, CART: A User Manual for Identifying Indicators of Vulnerability to Famine and Chronic Food Insecurity* 27 (IFPRI 1999).

dicted value of the outcome variable for cases in that terminal node. Finally, CART applies its pruning procedure: it first calculates the cost (mean squared error) of each subtree and then selects the smallest subtree that is within one standard error of the minimum cost subtree.

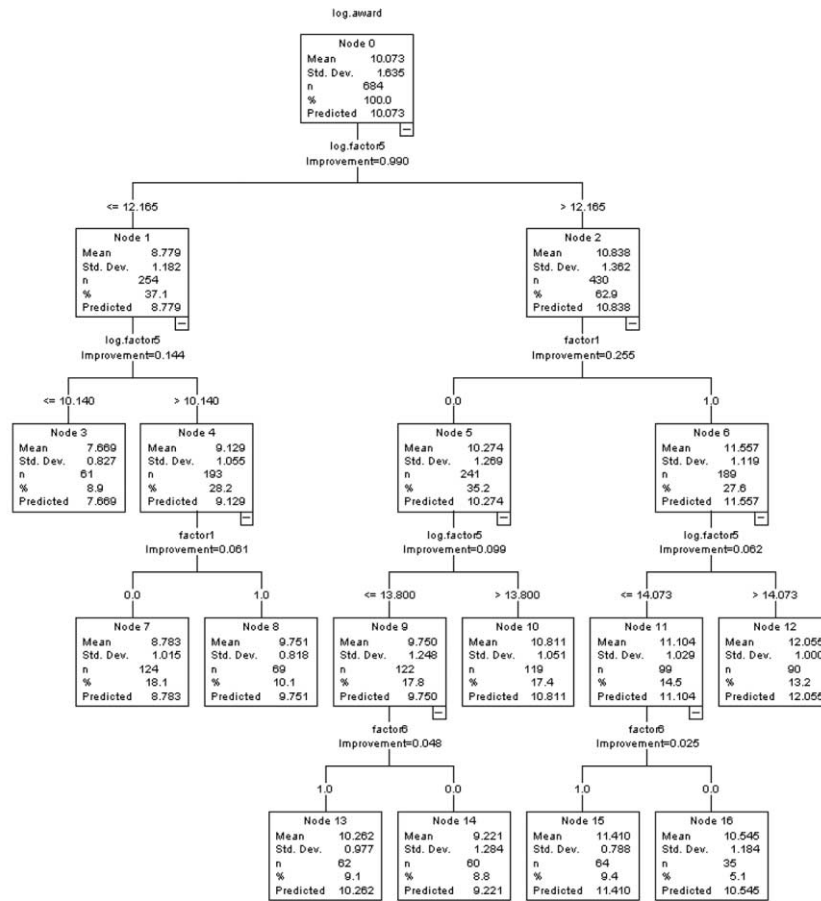
**2. Results.** In the benchmark regression tree model, labeled Model 6, the outcome variable is the log-transformed salvage award and the set of predictors comprises the six *Blackwall* factors (where the value of the property saved (factor 5) is log-transformed). In addition, the impurity measure is LSD, the minimum impurity improvement required to split a node is 0.0001, the maximum tree depth is ten,<sup>123</sup> and the minimum node size is thirty-five cases (5 percent). After the initial tree is grown (subject to the foregoing criteria or limitations), it is pruned to avoid overfitting according to the standard pruning procedure described above.

Figure 6 displays the benchmark regression tree and associated statistics.<sup>124</sup> Figure 7 displays the relative importance of the six

<sup>123</sup> This proves never to be a binding constraint.

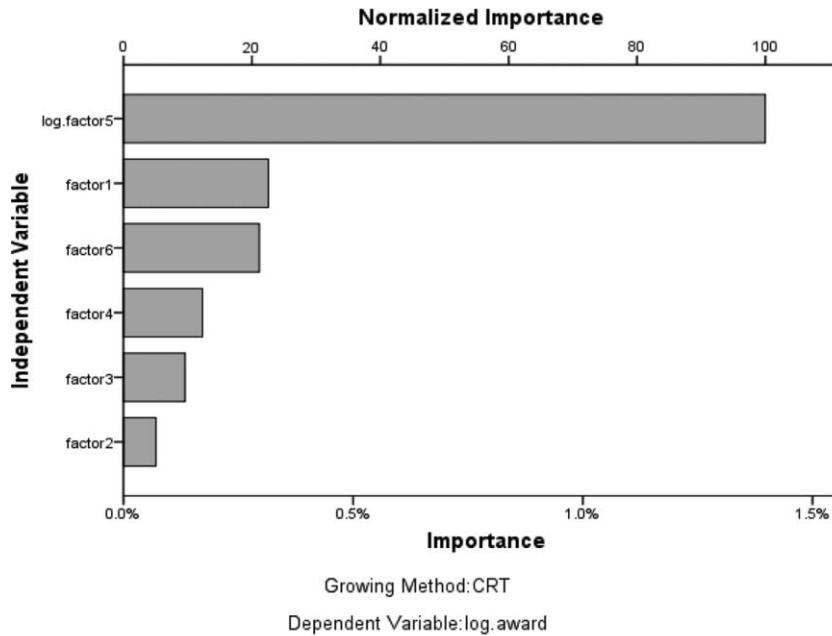
<sup>124</sup> The way to read the tree is as follows. Starting at the top with the root node, cases with “low” awards, in which  $\log.award \leq 12.165$  (that is, the award is less than or equal to \$191,952), proceed down the left branch. Cases with “high” awards, in which the award is greater than \$191,952, proceed down the right branch. Each sub-branch gives a rule for further splits. Nodes without subbranches beneath them are terminal nodes, and the mean award in a terminal node is the predicted award for all cases therein. Moving down the left branch of the tree, cases with low awards are further split based on the value of the property saved (factor 5). For cases in which  $\log.factor5 \leq 10.140$  (that is, the value of the property saved is less than or equal to \$25,336), the predicted value of  $\log.award$  is 7.669 (that is, the predicted award is \$2,141). However, cases in which the value of the property saved is greater than \$25,336 are further split based on  $factor1$  (the labor expended by the salvors). For cases in which  $factor1 = 0$  (that is, the labor expended by the salvors is low), the predicted award is \$6,522. For cases in which the labor expended is high, the predicted award is \$17,171. Moving down the right branch of tree, cases with high awards are further split based on the labor expended by the salvors (factor 1) and then on the value of the property saved (factor 5). For cases in which the labor expended is low and the value of the property saved is greater than \$984,609, the predicted award is \$49,563. For cases in which the labor expended is high and the value of the property saved is greater than \$1,293,678, the predicted award is \$171,957. Other cases are further split based on the danger to the property saved (factor 6). For cases in which the labor expended is low and the value of the property saved is less than or equal to \$984,609, the predicted award is \$10,107 for cases in which the danger to the property saved is low and \$28,624 for cases in which the danger is high. For cases in which the labor expended is high and the value of the property saved is less than or equal to \$1,293,678, the predicted award is \$37,987 for cases in which the danger to the property saved is low and \$90,219 for cases in which the danger is high.





Model Summary		Results Summary	
Dependent variable:	log_award	Number of nodes:	17
Independent variables:	factor1, factor2, factor3, factor4, log_factor5, factor6	Number of terminal nodes:	9
Growing method:	CART	Tree depth:	4
Impurity measure:	LSD	Resubstitution cost est. (std. err.):	0.987 (0.065)
Minimum improvement:	0.0001	Cross-validated cost est. (std. err.):	1.096 (0.070)
Maximum tree depth:	10	Proportion of variance explained:	0.631
Minimum cases per node:	35		
Pruning max. cost difference:	1 standard error		
Cost estimation method:	10-fold cross-validation		

Figure 6. Model 6 — Benchmark Regression Tree



Factor	Importance	Normalized Importance
<i>log.factor5</i>	1.397	100.0
<i>factor1</i>	0.316	22.6
<i>factor6</i>	0.296	21.2
<i>factor4</i>	0.172	12.3
<i>factor3</i>	0.134	9.6
<i>factor2</i>	0.071	5.1

Figure 7. Importance of Factors

*Blackwall* factors to the model.<sup>125</sup> There are three main takeaways from these Figures. First, the tree is fairly simple—it classifies cases into nine terminal nodes using three factors (listed in descending order of importance): the value of the property saved (factor 5); the

<sup>125</sup> To calculate the importance score of a variable, CART sums over all nodes the impurity improvements attributable to the variable in its role as primary or surrogate splitter. A variable is the primary splitter at a node if the maximum impurity improvement is achieved by splitting on that variable. It is a surrogate splitter if splitting on that variable achieves at least the minimum impurity improvement required for a split.

labor expended by the salvors (factor 1); and the danger to the property saved (factor 6). Note that this does not imply that the other factors are not important. They are; they account in part for the variation of awards within the terminal nodes.<sup>126</sup> Second, the complete ranking of factors is the same as in the benchmark MFP regression model: after the top three, the bottom three are (in descending order of importance): the risk incurred by the salvors (factor 4); the danger to the salvors' property (factor 3); and the skill displayed by the salvors (factor 2). Third, the model, which includes as predictors only the six *Blackwall* factors, explains slightly less than two-thirds of the variation in the salvage awards. As before, regrowing the tree with restricted sets of predictors reveals that (i) the value of the property saved (factor 5) alone explains half of the variation in the awards and (ii) the top three factors (factors 5, 1, and 6) account for nearly all of the collective explanatory power of all six factors.

To check the sensitivity of the benchmark results to the minimum node size and the set of predictors, two additional trees are grown. In Model 7, the minimum node size is reduced to ten cases (1.5 percent). In Model 8, the set of predictors is expanded to include the moiety indicator and circuit and era indicators. In the case of Model 7, the tree is more complex than the benchmark tree (it classifies cases into seventeen terminal nodes); however, it still uses only factors 5, 1, and 6 to classify cases and the other main takeaways are also unchanged. Indeed, reducing the minimum node size to ten cases increases the proportion of variance explained to slightly more than two-thirds (however, the cross-validated cost estimate also increases slightly, due to the increased complexity of the tree). In the case of Model 8, the tree is virtually identical to the benchmark tree, and the main takeaways remain unchanged. The only difference in the results is a slightly higher cross-validated cost estimate, due to the additional predictors. Unlike in the MFP regression analysis, however, the inclusion of the additional predictors does not alter the ranking of the factors.

## V. CONCLUSION

Under U.S. maritime law, a salvor of imperiled maritime property on navigable waters is entitled to a monetary award from the owner. When the salvage service is rendered voluntarily in the absence of a contract, the court must determine the salvage award according to the six factors enumerated by the Supreme Court in *The Blackwall*: (1) the labor expended by the salvors, (2) the skill displayed by the salvors, (3) the danger to the salvors' property, (4) the risk incurred

<sup>126</sup> In addition, each qualifies as a surrogate splitter at multiple nodes.

by the salvors, (5) the value of the property saved, and (6) the danger to the property saved. The law, however, does not specify a precise formula or rule for calculating awards on the basis of the *Blackwall* factors; it provides only a handful of general principles to guide courts and delimit their discretion.

This Article investigates empirically how courts turn their findings on the *Blackwall* factors into salvage awards. It employs two statistical methods—fractional polynomial regression and regression tree analysis—to make inferences about the mapping from factors to awards implicit in the reported decisions by U.S. courts in salvage cases from 1799 to 2007. Three main conclusions emerge from the empirical analysis. First, the results evidence a positive, statistically significant relationship between the *Blackwall* factors and the magnitude of the salvage award, and they indicate a power law relationship between the award and the value of the property saved. Second, the results suggest a ranking of the *Blackwall* factors, in which the three most important factors, in descending order of importance, are the value of the property saved (factor 5), the labor expended by the salvors (factor 1), and the danger to the property saved (factor 6). Third, the *Blackwall* factors collectively explain approximately two-thirds of the variation in the salvage awards.

An important contribution of this Article is that it represents the first empirical doctrinal study of the law governing U.S. marine salvage awards. As such, it complements the traditional doctrinal analysis offered by other maritime commentators. Another important contribution of the Article is that it showcases and juxtaposes fractional polynomial regression and regression tree analysis, two very different yet complementary statistical methods that are well suited to empirical doctrinal analysis but are underutilized in legal scholarship.

## APPENDIX

1. *Falliage v The Hope*, 8 F Cas 975 (Adm Pa 1779) (No 4,626).
2. *Weeks v The Catharina Maria*, 29 F Cas 579 (D Pa 1790) (No 17,351).
3. *Warder v La Belle Creole*, 29 F Cas 215 (D Pa 1792) (No 17,165).
4. *Hindry v The Priscilla*, 12 F Cas 201 (D SC 1792) (No 6,515).
5. *The Mary Ford*, 3 US (3 Dall) 188 (1796).
6. *Wilkie v Two Hundred Five Boxes of Sugar*, 29 F Cas 1247 (D SC 1796) (No 17,662).
7. *Concklin v The Harmony*, 6 F Cas 259 (D NY 1797) (No 3,089).

8. *Booth v L'Esperanza*, 3 F Cas 885 (D SC 1798) (No 1,647).
9. *Schutz v The Nancy*, 21 F Cas 759 (D SC 1799) (No 12,493).
10. *Cowell v The Brothers*, 6 F Cas 668 (D SC 1799) (No 3,294).
11. *Clayton v The Harmony*, 5 F Cas 994 (D Pa 1799) (No 2,871).
12. *Cross v The Dolphin*, 6 F Cas 892 (D SC 1800) (No 3,432).
13. *Brevoor v The Fair American*, 4 F Cas 71 (D Pa 1800) (No 1,847).
14. *Stephens v Bales of Cotton*, 22 F Cas 1278 (D SC 1800) (No 13,366).
15. *Kennedy v Ricker*, 14 F Cas 318 (D NH 1801) (No 7,705).
16. *Talbot v Seeman*, 5 US (1 Cranch) 1 (1801).
17. *Taylor v Twenty-Five Thousand Dollars*, 23 F Cas 806 (D SC 1801) (No 13,807).
18. *British Consul v Twenty-Two Pipes*, 4 F Cas 173 (D SC 1801) (No 1,900).
19. *Cross v The Bellona*, 6 F Cas 886 (D SC 1803) (No 3,428).
20. *Morehouse v The Jefferson*, 17 F Cas 738 (DNY 1803) (No 9,793).
21. *Bass v Five Negroes*, 2 F Cas 1006 (D SC 1803) (No 1,093).
22. *Mason v The Blaireau*, 6 US (2 Cranch) 240 (1804).
23. *Jerby v One Hundred & Ninety-Four Slaves*, 13 F Cas 550 (D SC 1806) (No 7,288).
24. *Taylor v The Cato*, 23 F Cas 752 (D Pa 1806) (No 13,786).
25. *Bond v The Cora*, 3 F Cas 835 (D Pa 1806) (No 1,620).
26. *Small v The Messenger*, 22 F Cas 366 (D Pa 1807) (No 12,961).
27. *Bell v The Ann*, 3 F Cas 88 (D Pa 1807) (No 1,245).
28. *Flinn v The Leander*, 9 F Cas 275 (D SC 1808) (No 4,870).
29. *Tyson v Prior*, 24 F Cas 489 (CC D Mass 1812) (No 14,319).
30. *Rowe v The Brig*, 20 F Cas 1281 (CC D Mass 1818) (No 12,093).
31. *The Sybil*, 17 US 98 (1819), *affg*, 9 F Cas 141 (CC D SC 1816) (No 4,824).
32. *The Maria Josepha*, 16 F Cas 733 (CC D SC 1819) (No 9,078).
33. *Hollingsworth v Seventy Doubloons*, 12 F Cas 380 (ED Pa 1820) (No 6,620).
34. *Le Tigre*, 15 F Cas 404 (D NJ 1820) (No 8,281).
35. *The Two Catherines*, 24 F Cas 424 (D RI 1821) (No 14,288).
36. *Lewis v The Elizabeth & Jane*, 8 F Cas 474 (D Me 1823) (No 4,356).
37. *Am Ins Co v Johnson*, 1 F Cas 665 (SDNY 1827) (No 303).
38. *Peabody v Proceeds of Twenty-Eight Bags of Cotton*, 19 F Cas 39 (D Mass 1829) (No 10,869).
39. *Hand v The Elvira*, 11 F Cas 413 (ED Pa 1829) (No 6,015).
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41. *The Galaxy*, 9 F Cas 1075 (SDNY 1831) (No 5,186).
42. *Parter v The Friendship*, 18 F Cas 1271 (D Mass 1831) (No 10,783).
43. *The Emulous*, 8 F Cas 704 (CC D Mass 1832) (No 4,480).
44. *The Boston*, 3 F Cas 932 (CC D Mass 1833) (No 1,673).
45. *The Henry Ewbank*, 11 F Cas 1166 (CC D Mass 1833) (No 6,376).
46. *The Lexington*, 15 F Cas 501 (D Fla 1835) (No 8,336).
47. *Courcier v Ritter*, 6 F Cas 644 (SD Fla 1836) (No 3,282).
48. *The Bee*, 3 F Cas 41 (D Me 1836) (No 1,219).
49. *The Dorothea Foster*, 1 F Cas 989 (D Fla 1836) (No 429).
50. *The America*, 1 F Cas 596 (SD Fla 1836) (No 279).
51. *Lea v The Alexander*, 15 F Cas 91 (CC D SC 1836) (No 12,630).
52. *The Rising Sun*, 20 F Cas 828 (D Me 1837) (No 11,858).
53. *The Ella Hand*, 8 F Cas 502 (SD Fla 1837) (No 4,396).
54. *Williams v The Adolphe*, 29 F Cas 1350 (D RI 1837) (No 17,712).
55. *The La Bruce*, 14 F Cas 905 (D Fla 1837) (No 7,963).
56. *The Howard*, 12 F Cas 630 (SD Fla 1838) (No 6,752a).
57. *Smith v The Joseph Stewart*, 22 F Cas 582 (ED Pa 1838) (No 13,070).
58. *The Alabamian*, 1 F Cas 283 (SD Fla 1839) (No 128).
59. *The Amethyst*, 1 F Cas 762 (D Me 1840) (No 330).
60. *The Herman*, 12 F Cas 23 (SD Fla 1840) (No 6,406).
61. *Walter v The Montgomery*, 29 F Cas 113 (D Fla 1840) (No 17,120).
62. *The Emblem*, 8 F Cas 611 (D Me 1840) (No 4,434).
63. *Bearse v Three Hundred & Forty Pigs of Copper*, 2 F Cas 1192 (CC D Mass 1840) (No 1,193).
64. *The Amistad*, 40 US (15 Pet) 518 (1841).
65. *Bean v The Grace Brown*, 2 F Cas 1136 (ED Va 1841) (No 1,171).
66. *Hartshorn v Twenty-Five Cases Silk*, 11 F Cas 713 (SDNY 1841) (No 6,168a).
67. *Lears v One Cask Oil*, 15 F Cas 105 (SDNY 1842) (No 8,161a).
68. *Sprague v One Hundred & Forty Barrels of Flour*, 22 F Cas 968 (CC D Mass 1842) (No 13,253).
69. *Evans v The Charles*, 8 F Cas 838 (D La 1842) (No 4,556).
70. *Cartwell v The John Taylor*, 5 F Cas 228 (ED La 1842) (No 2,482).
71. *The North America*, 18 F Cas 333 (SD Fla 1843) (No 10,313).

72. *Sanderson v The Ann Johnson*, 21 F Cas 327 (SD Fla 1843) (No 12,297a).
73. *Johnson v Certain Goods*, 13 F Cas 736 (D Mass 1843) (No 7,377).
74. *Two Hundred e Ten Barrels of Oil*, 24 F Cas 448 (D Mass 1844) (No 14,297).
75. *Howland v Two Hundred e Ten Barrels of Oil*, 12 F Cas 745 (D Mass 1844) (No 6,801).
76. *The John Gilpin*, 13 F Cas 675 (SDNY 1845) (No 7,345).
77. *The Tellumah*, 23 F Cas 835 (SD Fla 1846) (No 13,823).
78. *The York*, 30 F Cas 818 (SD Fla 1846) (No 18,140).
79. *The John Wurts*, 13 F Cas 903 (SDNY 1847) (No 7,434).
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81. *The Harvest*, 11 F Cas 726 (D Mass 1848) (No 6,176).
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83. *The H B Foster*, 11 F Cas 948 (SDNY 1848) (No 6,290).
84. *Bethel v The Euphrasia*, 8 F Cas 813 (SD Fla 1848) (No 4,545).
85. *The Millinocket*, 17 F Cas 391 (SD Fla 1848) (No 9,609).
86. *Raft of Spars*, 20 F Cas 173 (SDNY 1849) (No 11,529).
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88. *Union Tow-Boat Co v The Delphos*, 24 F Cas 700 (ED La 1849) (No 14,400).
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90. *Geiger v The Mount Washington*, 17 F Cas 925 (SD Fla 1851) (No 9,887).
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92. *Acosta v The Merchant*, 17 F Cas 35 (SD Fla 1851) (No 9,435).
93. *The Telamon*, 23 F Cas 834 (SD Fla 1852) (No 13,820).
94. *McGinnis v The Pontiac*, 16 F Cas 112 (D Ohio 1852) (No 8,801).
95. *Montgomery v The T P Leathers*, 17 F Cas 640 (ED La 1852) (No 9,736).
96. *Greene v The F A Everett*, 8 F Cas 946 (SD Fla 1853) (No 4,603).
97. *The Nathaniel Kimball*, 17 F Cas 1201 (SD Fla 1853) (No 10,033).
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100. *The Cimbus*, 5 F Cas 686 (SD Fla 1853) (No 2,718).
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106. *The Robert Morris*, 20 F Cas 876 (SD Fla 1853) (No 11,893).
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126. *The Diadem*, 7 F Cas 632 (SD Fla 1856) (No 3,874).
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128. *Spencer v The Charles Avery*, 22 F Cas 917 (SD Ohio 1857) (No 13,232).
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130. *Caste v The Helen E Booker*, 11 F Cas 1039 (SD Fla 1857) (No 6,330).
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134. *Curtis v Quantity of Wearing Apparel*, 6 F Cas 1007 (SDNY 1858) (No 3,505).
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139. *The Osteonthe*, 18 F Cas 893 (SD Fla 1858) (No 10,608a).
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145. *The John E Clayton*, 13 F Cas 666 (CC SDNY 1859) (No 7,338).
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147. *The Mulhouse*, 17 F Cas 962 (SD Fla 1859) (No 9,910).
148. *The Mary Coe*, 16 F Cas 972 (SD Fla 1860) (No 9,204).
149. *The Eliza Mallory*, 8 F Cas 492 (SD Fla 1860) (No 4,365).
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151. *Sturgis v The Joseph Johnson*, 23 F Cas 323 (SDNY 1860) (No 13,576).
152. *The Huntsville*, 12 F Cas 996 (E D SC 1860) (No 6,916).
153. *Pent v The Ocean Belle*, 19 F Cas 200 (SD Fla 1861) (No 10,961).
154. *Sawyer v The Maria Pike*, 16 F Cas 740 (SD Fla 1861) (No 9,081).
155. *Strout v The Cuba*, 23 F Cas 262 (SDNY 1861) (No 13,549).
156. *Adams v The Island City*, 1 F Cas 119 (2d Cir 1859), *affd*, 66 US 121 (1861) (No 55).
157. *The Czarina*, 6 F Cas 1106 (CC D Mass 1862) (No 3,531).
158. *W Transp Co v The Great Western*, 29 F Cas 777 (N D N Y 1862) (No 17,443).
159. *The Thomas Hunt*, 22 F Cas 1140 (D Conn 1862) (No 13,326).

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160. *Sturgis v The Edward*, 23 F Cas 322 (D N Y 1863) (No 13,575).
161. *The James T Abbott*, 13 F Cas 340 (D Mass 1864) (No 7,202).
162. *Winso v The Cornelius Grinnell*, 30 F Cas 309 (SDNY 1864) (No 17,883).
163. *Towle v The Great Eastern*, 24 F Cas 75 (SDNY 1864) (No 14,110).
164. *The Ida L Howard*, 12 F Cas 1163 (D Mass 1865) (No 6,999).
165. *The Zealand*, 30 F Cas 917 (D Mass 1865) (No 18,205).
166. *The Charles Henry*, 5 F Cas 509 (EDNY 1865) (No 2,617).
167. *The Caroline Nesmith*, 5 F Cas 99 (SD Fla 1865) (No 2,423).
168. *The Harwood*, 11 F Cas 763 (SD Fla 1866) (No 6,186).
169. *The Albion Lincoln*, 1 F Cas 312 (D Mass 1866) (No 144).
170. *The Georgiana*, 10 F Cas 249 (D Mass 1866) (No 5,355).
171. *Holmes v The Joseph C Griggs*, 12 F Cas 417 (EDNY 1866) (No 6,640).
172. *Llewellyn v Two Anchors & Chains*, 15 F Cas 711 (EDNY 1866) (No 8,428).
173. *The Joseph A Davis*, 13 F Cas 1132 (SD Fla 1866) (No 7,534).
174. *The M B Stetson*, 16 F Cas 1272 (D Mass 1866) (No 9,363).
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177. *Bowley v Goddard*, 3 F Cas 1072 (D Mass 1867) (No 1,736).
178. *The Saragossa*, 21 F Cas 426 (SDNY 1867) (No 12,335).
179. *The Saragossa*, 21 F Cas 425 (SDNY 1867) (No 12,334).
180. *The Merrimac*, 17 F Cas 117 (EDNY 1867) (No 9,473).
181. *Seamen v Erie Ry Co*, 21 F Cas 918 (EDNY 1868) (No 12,582).
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