

This analysis uses nationally collected landings data for the for the Gulf of Mexico region, downloaded from the NOAA FOSS site <https://foss.nmfs.noaa.gov/apexfoss/f?p=215:200:.....>.

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## [[1]]
## [1] "When back calculated,  $Q_{i,t}$  did not equal  $V_{i,t}/PI_{i,t}$ "
##
## [[2]]
## [1] "When back calculated,  $Q_{i,t}$  did not equal  $V_{i,t}/PI_{i,t}$ "
##
## [[3]]
## [1] "When back calculated,  $Q_{i,t}$  did not equal  $V_{i,t}/PI_{i,t}$ "
##
## [[4]]
## [1] "When back calculated,  $Q_t$  did not equal  $V_t/PI_t$ "
##
## [[5]]
## [1] "When back calculated,  $\ln(Q_t/Q_{t-1})$  = did not equal  $\text{sum}(\text{frac}\{R_{i,t} - R_{i,t-1}\}\{2\})$  *
##
## [[6]]
## [1] "Out of 112 columns, 198 of species V columns are completely empty, 198 of species Q columns are
```

Species in Each category by Common Name

## \$Finfish		
## [1] "SHARKS, UNCLASSIFIED **"	"SHARKS, UNIDENTIFIED **"	"SHARKS, MACKEREL **"
## [5] "SHARK, PORBEAGLE "	"SHARK, THRESHER "	"SHARK, BIGEYE TAIL "
## [9] "SHARK, LONGFIN MAKO "	"SHARK, NURSE "	"SHARK, TIGER "
## [13] "SHARK, SMOOTH DOGFISH "	"SHARK, DUSKY "	"SHARK, BULL "
## [17] "SHARK, BLACKNOSE "	"SHARK, BIGNOSE "	"SHARK, SILKY "
## [21] "SHARK, SPINNER "	"SHARK, FINETOOTH "	"SHARK, NIGHT "
## [25] "SHARK, LEMON "	"SHARK, HAMMERHEAD **"	"SHARK, BONNETHEAD "
## [29] "SHARK, GREAT HAMMERHEAD "	"SHARKS **"	"SHARK, DOGFISH "
## [33] "SAWFISH, SMALLTOOTH "	"BANDED GUITARFISH "	"LESSER ELECTRIC EEL "
## [37] "RAY, STINGRAYS **"	"SOUTHERN STINGRAY "	"RAYS, BUTTERFLY "
## [41] "STURGEONS **"	"PADDLEFISH "	"GARS **"
## [45] "SPOTTED GAR "	"SHORTNOSE GAR "	"BOWFIN "
## [49] "EELS **"	"EEL, AMERICAN "	"EEL, MORAYS **"
## [53] "SPOTTED MORAY "	"BLACKEDGE MORAY "	"GOLDENTAIL MORAY "
## [57] "EEL, CONGER "	"EELS, SNAKE **"	"SHARPTAIL EEL "
## [61] "SPECKLED WORM EEL "	"HERRINGS **"	"SHAD, AMERICAN "
## [65] "ALEWIFE "	"MENHADEN **"	"MENHADEN, ATLANTIC "
## [69] "SHAD, THREADFIN "	"HERRING, ROUND "	"HERRING, ATLANTIC "
## [73] "SARDINE, SPANISH "	"MOONEYES **"	"CHUBS **"
## [77] "INSHORE LIZARDFISH "	"CARPS AND MINNOWS **"	"CARP, COMMON "
## [81] "SILVER CARP "	"BIGHEAD CARP "	"SUCKERS **"
## [85] "CATFISHES-BULLHEADS, UNCLASSIFIED **"	"CATFISHES-BULLHEADS **"	"CATFISH, BLUE "
## [89] "CATFISH, FLATHEAD "	"BULLHEADS **"	"CATFISHES-BULLHEADS "
## [93] "GAFFTOPSAIL CATFISH "	"TOADFISHES **"	"CLINGFISH FAMILY "
## [97] "FROGFISHES **"	"SARGASSUMFISH "	"OCCELLATED FROGFISH "
## [101] "COD FAMILY **"	"HAKES, RED AND WHITE **"	"HAKE, WHITE "
## [105] "CUSK-EELS **"	"BROTULA, BEARDED "	"KEY BROTLA "
## [109] "FLYINGFISHES **"	"HEMIRAMPHUS **"	"BALLYHOO "
## [113] "NEEDLEFISH, ATLANTIC "	"KILLIFISH FAMILY **"	"MANGROVE GAMBUSIA "
## [117] "RED BREAM "	"SQUIRRELFISHES **"	"BLACKBAR SOLDIERFISH "

## [121] "TRUMPETFISH "	"BLUESPOTTED CORNETFISH "	"SARGASSUM PIPEFISH "
## [125] "LINED SEAHORSE "	"DWARF SEAHORSE "	"SCORPIONFISHES "
## [129] "SCORPIONFISH, SPINYCHEEK "	"LONGSNOUT SCORPIONFISH "	"SCORPIONFISH, SPINYCHEEK "
## [133] "LIONFISHES **"	"LIONFISH, RED "	"SEAROBINS **"
## [137] "RAVEN, SEA "	"SNOOK "	"GROUPERS **"
## [141] "BASSES, MIXED SEA **"	"BASS, BLACK SEA "	"SEA BASS, BANK "
## [145] "GROUPER, GOLIATH "	"HIND, ROCK "	"HIND, SPECKLED "
## [149] "HIND, RED "	"GROUPER, RED "	"GROUPER, MISTY "
## [153] "GROUPER, SNOWY "	"GROUPER, NASSAU "	"CONEY "
## [157] "MUTTON HAMLET "	"GAG "	"GROUPER, BLACK "
## [161] "SCAMP "	"GROUPER, YELLOWFIN "	"GROUPER, TIGER "
## [165] "SAND PERCH "	"SAND PERCH, DWARF "	"SPANISH FLAG "
## [169] "BARBIER, RED "	"BUTTER HAMLET "	"WRASSE BASS "
## [173] "PEPPERMINT BASS "	"CREOLE-FISH "	"LANTERN BASS "
## [177] "TOBACCOFISH "	"HARLEQUIN BASS "	"CHALK BASS "
## [181] "SOAPFISH GENUS **"	"THREELINE BASSLET "	"BIGEYE FAMILY **"
## [185] "GLASSEYE SNAPPER "	"BIGEYE, SHORT "	"CARDINALFISH FAMILY "
## [189] "TWO SPOT CARDINALFISH "	"TILEFISHES **"	"TILEFISH, BLACK "
## [193] "TILEFISH, BLUELINE "	"TILEFISH, GOLDFACE "	"TILEFISH, GOLDEN "
## [197] "BLUEFISH "	"COBIA "	"REMORA FAMILY **"
## [201] "JACKS **"	"POMPANO, AFRICAN "	"YELLOW JACK "
## [205] "JACK, HORSE-EYE "	"RUNNER, BLUE "	"JACK, BLACK "
## [209] "BUMPER, ATLANTIC "	"LEATHERJACK "	"SCAD, BIGEYE "
## [213] "MOONFISH, ATLANTIC "	"AMBERJACK **"	"AMBERJACK, GREAT "
## [217] "JACK, ALMACO "	"RUDDERFISH, BANDED "	"POMPANO, FLORIDA "
## [221] "SCADS **"	"SCAD, ROUND "	"RUNNER, RAINBOW "
## [225] "PILOTFISH "	"DOLPHIN GENUS **"	"DOLPHINFISH "
## [229] "SNAPPERS **"	"SNAPPER, CUBERA "	"SNAPPER, GRAY "
## [233] "SNAPPER, SCHOOLMASTER "	"SNAPPER, BLACKFIN "	"SNAPPER, RED "
## [237] "SNAPPER, MAHOGANY "	"SNAPPER CARIBBEAN RED "	"SNAPPER, LANE "
## [241] "SNAPPER, BLACK "	"SNAPPER, QUEEN "	"SNAPPER, YELLOW "
## [245] "WENCHMAN "	"TRIPLETAIL "	"MOJARRAS **"
## [249] "GRUNTS **"	"GRUNT, TOMTATE "	"MARGATE "
## [253] "GRUNT, COTTONWICK "	"PIGFISH "	"BLACK MARGATE "
## [257] "BARRED GRUNT "	"SCUPS OR PORGIES **"	"PORGY, LONGSPIN "
## [261] "SHEEPSHEAD "	"PINFISH, SPOTTAIL "	"PORGY, GRASS "
## [265] "PORGY, WHITEBONE "	"PORGY, KNOBBED "	"PORGY, LITTLEHEAD "
## [269] "DRUMS **"	"SEATROUT, SPOTTED "	"SILVER SEATROUT "
## [273] "SEATROUT, SAND "	"SPOT "	"KINGFISHES **"
## [277] "GULF KINGFISH "	"CROAKER, ATLANTIC "	"DRUM, BLACK "
## [281] "JACKKNIFE-FISH "	"SPOTTED DRUM "	"CUBBYU "
## [285] "REEF CROAKER "	"DRUM, FRESHWATER "	"GOATFISHES **"
## [289] "SPOTTED GOATFISH "	"GLASSY SWEEPER "	"SEA CHUBS **"
## [293] "SPADEFISH, ATLANTIC "	"BUTTERFLYFISHES **"	"SPOTFIN BUTTERFLY "
## [297] "REEF BUTTERFLYFISH "	"BANDED BUTTERFLYFISH "	"LONGSNOUT BUTTERFLY "
## [301] "QUEEN ANGELFISH "	"ROCK BEAUTY "	"BLUE ANGELFISH "
## [305] "FRENCH ANGELFISH "	"LEAFFISH, AFRICAN "	"TILAPIAS **"
## [309] "SERGEANT MAJOR "	"BLUE CHROMIS "	"SUNSHINEFISH "
## [313] "PURPLE REEFFISH "	"YELLOWTAIL DAMSELFISH "	"REDSPOTTED HAWK "
## [317] "BIGSCALE POMFRET "	"MULLET **"	"MULLET, STRIPED "
## [321] "BARRACUDAS **"	"WRASSE FAMILY **"	"SPOTFIN HOGFISH "
## [325] "CREOLE WRASSE "	"SLIPPERY DICK "	"YELLOWHEAD WRASSE "
## [329] "BLACKEAR WRASSE "	"PUDDINGWIFE (WRASSE) "	"HOGFISH "
## [333] "PARROTFISHES **"	"BLUE PARROTFISH "	"MIDNIGHT PARROTFISH "

## [337] "PRINCESS PARROTFISH "	"QUEEN PARROTFISH "	"REDBAND PARROTFISH "
## [341] "JAWFISH FAMILY **"	"SPOTFIN JAWFISHES **"	"YELLOWHEAD JAWFISH "
## [345] "STARGAZER FAMILY **"	"SOUTHERN STARGAZER "	"COMBTOOTH BLENNY "
## [349] "BARRED BLENNY "	"REDLIP BLENNY "	"SAILFIN BLENNY "
## [353] "SADDLED BLENNY "	"BANDED BLENNY "	"MARBLED BLENNY "
## [357] "DRAGONETS **"	"GOBY FAMILY **"	"NAKED GOBY "
## [361] "SLEEPER FAMILY **"	"SURGEONFISHES **"	"OCEAN SURGEON "
## [365] "BLUE TANG "	"BONEFISH "	"OILFISH "
## [369] "CUTLASSFISH, ATLANTIC "	"TUNA, SKIPJACK "	"TUNA, LITTLE TUNA "
## [373] "MACKEREL (SCOMBER) **"	"MACKEREL, CHUB "	"MACKEREL, ATLANTIC "
## [377] "TUNA, ALBACORE "	"TUNA, BLUEFIN "	"TUNA, YELLOWFIN "
## [381] "TUNA, BIGEYE "	"MACKEREL, KING AND CERO **"	"MACKEREL, KING "
## [385] "MACKEREL, CERO "	"WAHOO "	"SWORDFISH "
## [389] "MARLIN, BLUE "	"BARRELFISH "	"BLACK DRIFTFISH "
## [393] "HARVESTFISH "	"BUTTERFISH "	"GULF BUTTERFISH "
## [397] "FLOUNDERS **"	"FLOUNDER, SUMMER "	"FLOUNDER, GULF "
## [401] "FLOUNDER, FOURSPOT "	"FLOUNDER, WITCH "	"GYMNACHIRUS **"
## [405] "SCRAWLED FILEFISH "	"TRIGGERFISH, GRAY "	"TRIGGERFISH, QUINCY "
## [409] "WHITESPOTTED FILEFISH "	"ORANGESPOTTED FILEFISH "	"TRIGGERFISH, OCEAN "
## [413] "FILEFISH **"	"BOXFISHES **"	"BOXFISH GENUS **"
## [417] "SCRAWLED COWFISH "	"HONEYCOMB COWFISH "	"PUFFERS **"
## [421] "SOUTHERN PUFFER "	"SHARPNOSE PUFFER "	"PORCUPINEFISH "
## [425] "GRAYSBY "	"GAR, ALLIGATOR "	"FILEFISHES **"
## [429] "ANCHOVIES **"	"XYRICHTYS **"	"YELLOWTAIL REEF "
## [433] "BEAUGREGORY "	"LONGFIN DAMSELFISH "	"COCOA DAMSELFISH "
## [437] "DUSKY DAMSELFISH "	"THREESpot DAMSELFISH "	"STRIPED BURRFISH "
## [441] "DEEPWATER SQUIRRELFISH "	"REEF SQUIRRELFISH "	"YELLOWLINE GOBY "
## [445] "NEON GOBY "	"GLASS BLENNY "	"ROUGHTONGUE BASS "
## [449] "KYPHOSUS SECTATOR "	"HIGH-HAT "	"BANK BUTTERFLYFISH "
## [453] "GREAT BARRACUDA "	"HARDHEAD CATFISH "	
##		
## \$Shellfish		
## [1] "SNAILS **"	"TROCHIDAE **"	"TEGULA **"
## [5] "NERITIDAE **"	"MESOGASTROPODA **"	"PERIWINKLES **"
## [9] "EPITONIIDAE **"	"JANTHINIDAE **"	"SNAILS (CONCHS) **"
## [13] "MILK CONCH "	"HAWKWING CONCH "	"COWRIE, ATLANTIC "
## [17] "FLAMINGO TONGUE "	"SNAIL, MOON **"	"SHARK EYE "
## [21] "TRITON, ANGULAR "	"MURICIDAE **"	"WHELK, KNOBBED "
## [25] "CROWN CONCH "	"NASSARIUS **"	"BRUISED NASSA "
## [29] "HORSE CONCH "	"OLIVIDAE **"	"MARGINELLIDAE **"
## [33] "FLORIDA MITER "	"CONUS **"	"MELAMPUS **"
## [37] "NUDIBRANCHS **"	"FLORIDA REGAL DORIS "	"POLYPLACOPHORA **"
## [41] "PINNIDAE **"	"SCALLOPS **"	"SCALLOP, CALICO "
## [45] "LIONS-PAW SCALLOP "	"OYSTER, ATLANTIC THORNY "	"FILECLAM, SPINY "
## [49] "MUSSELS, FW **"	"THREERIDGE "	"MAPLELEAF "
## [53] "BLEUFER "	"CLAM, QUAHOG **"	"SOUTHERN QUAHOG "
## [57] "CHAMIDAE **"	"ANGELWING "	"TEUTHIDA **"
## [61] "SQUID, LONGFIN LOLIGO "	"SQUID, ATLANTIC BRIEF "	"OCTOPUS **"
## [65] "OCTOPUS, ATLANTIC PYGMY "	"CARIBBEAN REEF OCTOPUS "	"OCTOPUS, ATLANTIC "
## [69] "CRUSTACEANS **"	"CRABS **"	"SHRIMP, DENDROBRANCH "
## [73] "PENAEUS **"	"SHRIMP, ATLANTIC & GULF, ROUGHNECK **"	"SHRIMP, SEABOB "
## [77] "SHRIMP, ROCK **"	"SHRIMP, ROCK "	"SHRIMP, FW **"
## [81] "SHRIMP, PEDERSON CLEANER "	"SHRIMP, SPOTTED CLEANER "	"ALPHEUS **"
## [85] "SHRIMP, CLEANER "	"SHRIMP, GOLDEN CORAL "	"SHRIMP, BANDED CORAL "

## [89] "PROCAMBARUS **"	"LOBSTER, CARIBBEAN SPINY "	"SPOTTED SPINY LOBSTER "
## [93] "SCYLLARIDES **"	"POLKADOTTED HERMIT "	"CRABS, LAND HERMIT "
## [97] "CRAB, SPOTTED PORCELAIN "	"CRABS, SAND **"	"PAGURISTES PUNCTATUS "
## [101] "THINSTRIPE HERMIT "	"TRICOLOR HERMIT "	"STAREYE HERMIT "
## [105] "ORANGECLAW HERMIT "	"CRABS, TRUE **"	"CRABS, BOX **"
## [109] "LOXORHYNCHUS **"	"CRAB, YELLOWLINE ARROW "	"CRAB, FALSE ARROW "
## [113] "MITHRACULUS **"	"CRAB, RED-RIDGED CLINGING "	"CRAB, GREEN CLINGING "
## [117] "CRAB, BLUE "	"CRABS, STONE **"	"CRAB, FLORIDA STONE "
## [121] "CRAB, NIMBLE SPRAY "	"UCA **"	"CRAB, BLUE LAND "
## [125] "SHRIMP, MANTIS "	"STARS, OTHER SEA **"	"SPINY SEA STAR "
## [129] "BASKET STAR "	"BLACK BRITTLE STAR "	"SCALY BRITTLE STAR "
## [133] "SEA URCHINS, UNCLASSIFIED **"	"SLATE PENCIL URCHIN "	"PURPLE-SPINED SEA "
## [137] "ROCK BORING URCHIN "	"BISCUITS, SEA **"	"BISCUIT, INFLATED "
## [141] "DOLLARS, OTHER SAND **"	"KEYHOLE SAND DOLLAR **"	"DOLLAR, NOTCHED SAND "
## [145] "SEA CUCUMBER, UNCLASSIFIED **"	"CUCUMBERS, OTHER SEA **"	"FLORIDA SEA CUCUMBER "
## [149] "PAGUROIDEA **"	"MAJOIDEA **"	"SHRIMP, BROWN "
## [153] "SHRIMP, WHITE "	"RANELLIDAE **"	"TURBINIDAE **"
## [157] "LETTUCE SLUG "	"COWRIE, ATLANTIC GRAY "	"CRAB, DEEPSEA GOLDEN "
## [161] "CRAB, FURCATE SPIDER "	"SHRIMP, FARFANTEPENAEUS SPP **"	
##		
## \$Other		
## [1] "WITHHELD FOR CONFIDENTIALITY "	"ULOTRICHAELES **"	"HAIKUA **"
## [4] "PENICILLUS **"	"CAULERPACEAE **"	"BRIDGES **"
## [7] "CORALLINACEAE **"	"FIG **"	"FOUR **"
## [10] "SPONGES, OTHER **"	"SPONGES **"	"HILL **"
## [13] "HALICLONA COMPRESSA "	"HYDRALIKE ANIMALS **"	"JEROME **"
## [16] "JAMAICAN CASSIOPEA "	"STOMOLOPHUS **"	"CORAL **"
## [19] "DEEPWATER CORAL "	"GROOVED-BLADE SEA WHIP "	"PEN **"
## [22] "PALYTHOA **"	"GREEN SEA MAT "	"CORAL **"
## [25] "CORALLIMORPHIDAE **"	"FLORIDA CORALLIMORPHARIAN "	"AC **"
## [28] "ANEMONE, GIANT CARIBBEAN "	"RINGED ANEMONE "	"RE **"
## [31] "SUN ANEMONE "	"MARINE WORM **"	"AM **"
## [34] "SABELLIDAE **"	"SERPULIDAE **"	"SP **"
## [37] "BRYOZOANS **"	"SESSILE TUNICATES **"	"SH **"
## [40] "FINFISH **"	"CONEY "	"GR **"
## [43] "GROUPE, MARBLED "	"JACK, BAR "	"SP **"
## [46] "SOUTHERN SENNET "	"MARLIN, WHITE "	"HA **"
## [49] "FROGS **"	"GRAY TREEFROG "	"GR **"
## [52] "TURTLES **"	"TURTLE, SNAPPING "	"CO **"
## [55] "RAZOR-BACKED MUSK TURTLE "	"MUD TURTLES **"	"TU **"
## [58] "TURTLES, BABY (YOUNG FW) **"	"PAINTED TURTLE "	"TU **"
## [61] "RIVER COOTER "	"SLIDER "	"TU **"
## [64] "TURTLE, GREEN SEA "	"TURTLE, SOFT-SHELL **"	"GR **"
## [67] "GARTER SNAKES **"	"CULEBRA-CORREDORA CONSTRICTOR "	"RO **"
## [70] "RAT SNAKE "	"GREEN WATER SNAKE "	"SO **"
## [73] "SPONGE, YELLOW "	"SPONGE, GRASS "	"SP **"
## [76] "PLANTS **"	"SHELLFISH, UNCLASSIFIED, MARINE, ORNAMENTAL **"	"EU **"
## [79] "NORTH AMERICAN SOFTSHELL TURTLES **"	"SPECKLED KINGSNAKE **"	"YE **"
## [82] "ALLIGATOR, AMERICAN "	"DIAMONDBACK WATER SNAKE\n "	"SP **"
## [85] "PLANEHEAD FILEFISH "	"TURTLE, ALLIGATOR SNAPPING "	"MI **"
## [88] "DISCOSOMA **"	"PIG FROG "	" " "

Where are there negative values?

X	Tsn	Year	State	AFS.Name	Pounds	Dollars	Collection	Confidentiality	category.tax
51314	165647	2014	New Jersey	MUMMICHOG	-321	-4494	Commercial	Public	Actinopteryg
72470	168791	2014	Connecticut	DOLPHINFISH	-1	-2	Commercial	Public	Actinopteryg

Where are there negative values?

X	Tsn	Year	State	AFS.Name	Pounds	Dollars	Collection	Confidentiality
429	11272	2017	Rhode Island	SEAWEED, KELP **	-1	7390	Commercial	Public
6543	79916	2015	New York	MUSSEL, SLIPPERSHELL	-1	NA	Commercial	Public
8386	81495	2010	Maryland	CLAM, QUAHOG **	-29	1506	Commercial	Public
25465	160502	2009	Virginia	SHARK, BONNETHEAD	-5	1011	Commercial	Public
28827	161030	2007	New Jersey	FINFISH **	-8	NA	Commercial	Public
51314	165647	2014	New Jersey	MUMMICHOG	-321	-4494	Commercial	Public
72470	168791	2014	Connecticut	DOLPHINFISH	-1	-2	Commercial	Public
92811	172412	2014	Connecticut	MACKEREL, CHUB	-1	NA	Commercial	Public
111150	551570	2017	Connecticut	SHRIMP, BROWN	-1	229	Commercial	Public