

Homework 9 -
https://github.com/Henryblake2777/Sds315_homework9

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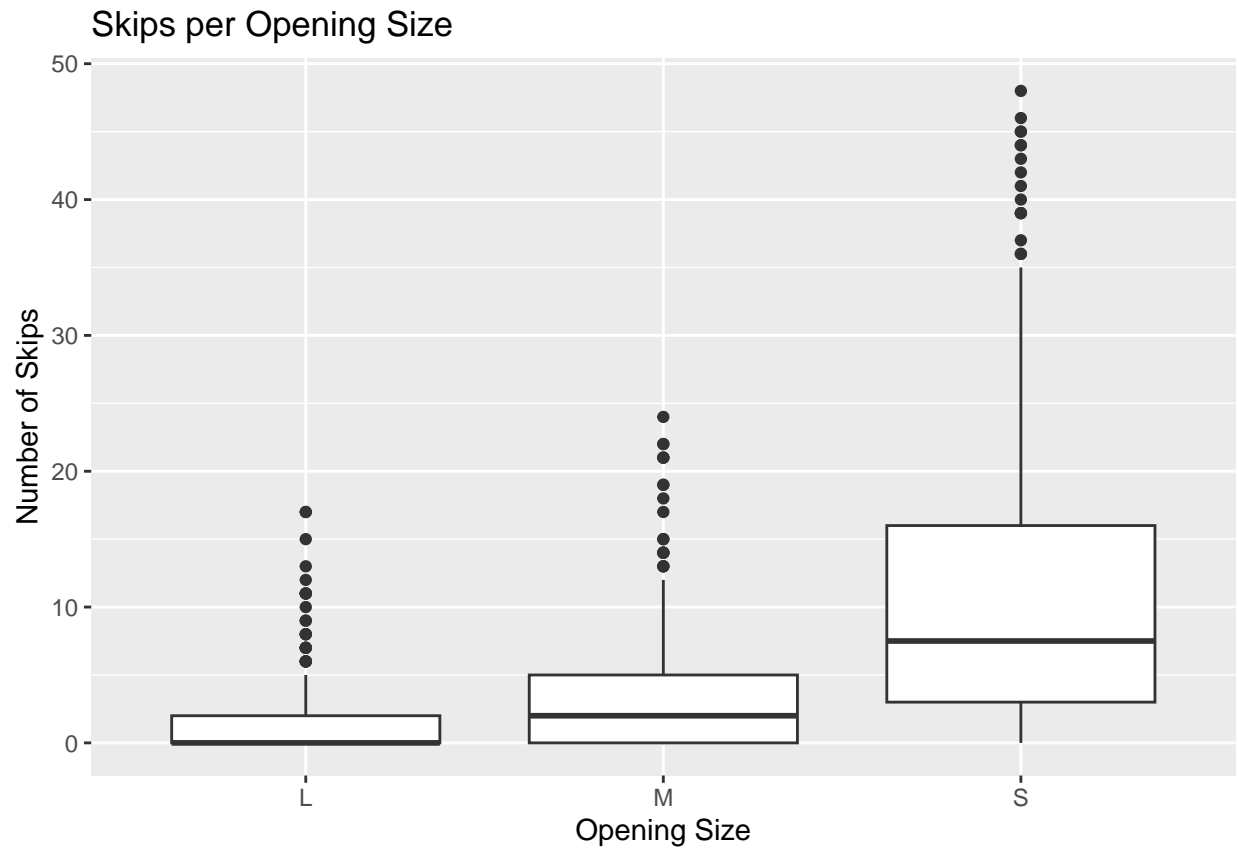
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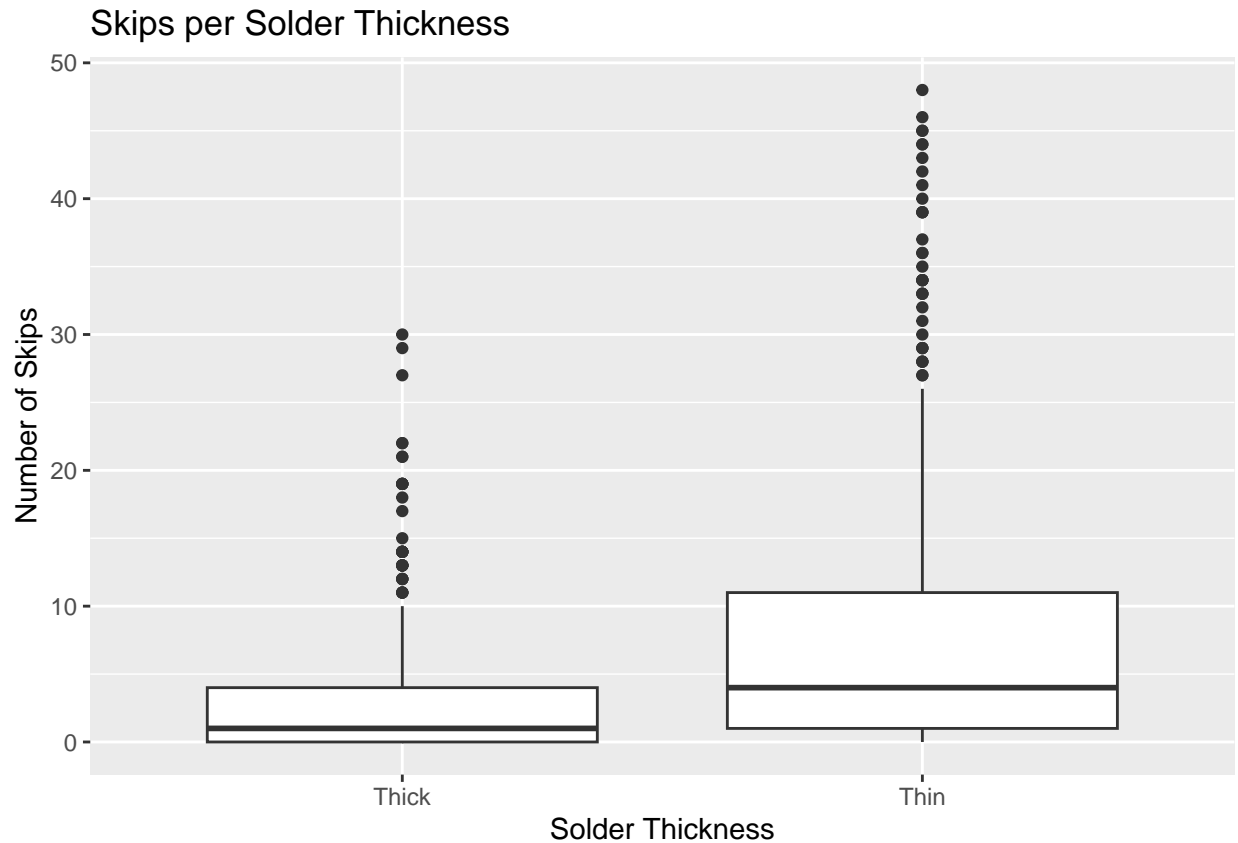
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Problem 1 - Manufacturing Flaws in Circuit Boards

Part A - Plots



This boxplot shows that smaller openings have more skips on average than larger openings.



This boxplot shows that the thin solder has, on average, more skips than the thick solder does.

Part B - Linear Model

##	name	lower	upper	level	method	estimate
## 1	Intercept	0.2297297	0.5838509	0.95	percentile	0.3933333
## 2	OpeningM	1.7184175	3.1307433	0.95	percentile	2.4066667
## 3	OpeningS	4.1666595	6.1786852	0.95	percentile	5.1266667
## 4	SolderThin	1.7054622	2.8892291	0.95	percentile	2.2800000
## 5	OpeningM.SolderThin	-1.9348237	0.5000864	0.95	percentile	-0.7400000
## 6	OpeningS.SolderThin	7.4666868	11.9144813	0.95	percentile	9.6533333
## 7	sigma	5.8251926	6.8581681	0.95	percentile	6.3729241
## 8	r.squared	0.3797098	0.4919754	0.95	percentile	0.4339639
## 9	F	109.4521787	173.1514877	0.95	percentile	137.0809061

Part C - Interpretation

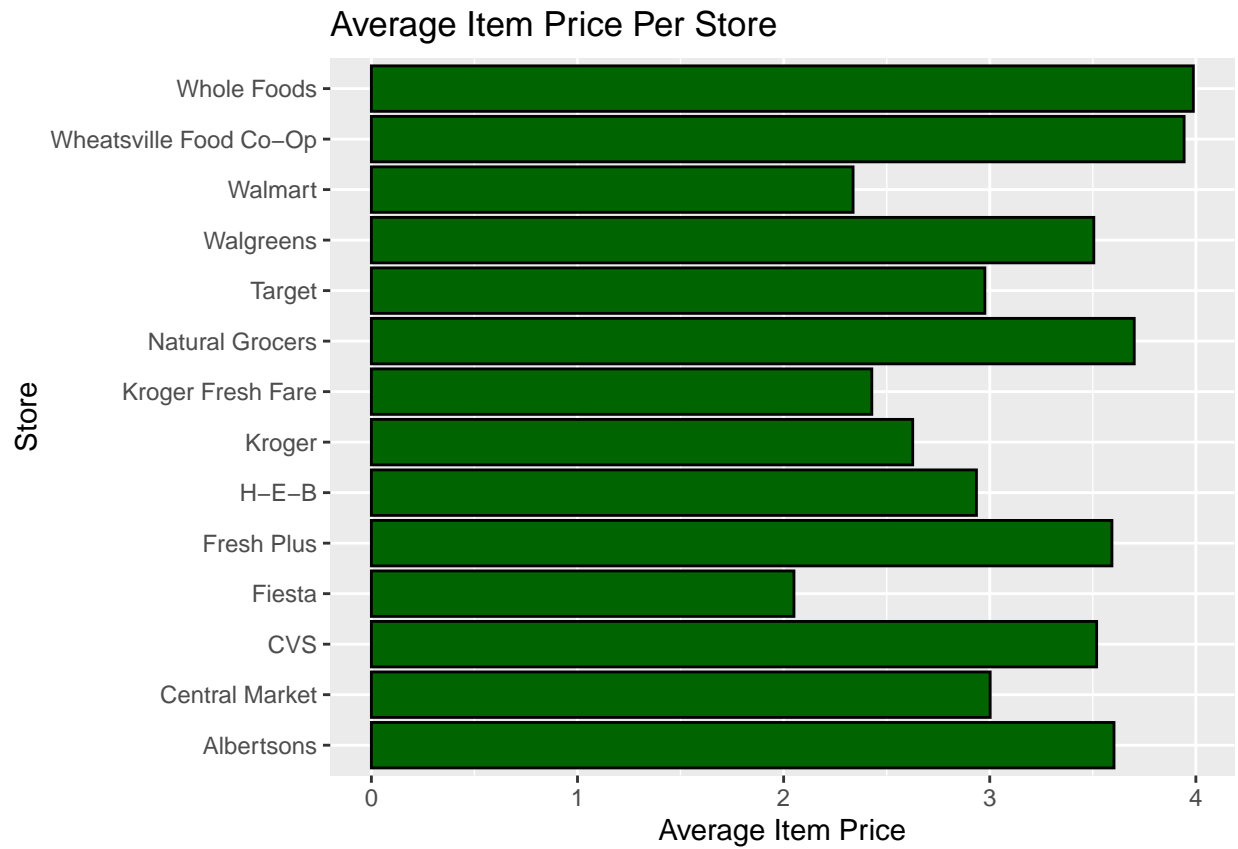
The baseline number of skips for a large opening a thick solder is an estimated .393 with a main effect of 2.407 for medium openings, 5.127 for small openings, and a 2.280 for a thin solder. There is also an interaction effect of -.740 skips for medium openings and thin solders and 9.653 for small openings and thin solders.

Part D - Conclusion

I would recommend a large opening and thick solder because it is the baseline and has the least amount of skips according to the model.

Problem 2 - Grocery Store Prices

Part A - Store Prices



The bar graph of store vs average item price shows that the most expensive store based on item price is Whole Foods, while the cheapest is Fiesta.

Part B - Item Availability



The bar graph of item availability vs item shows that the two most available items are milk and eggs, while the least are lucky charms, frosted flakes, el milagros tortilla chips, and cinnamon toast crunch.

Part C - Type of Store Linear Model

##	2.5 %	97.5 %
## (Intercept)	5.4461802	6.4011154524
## Product12 Pack Sprite	-0.6340950	0.5974283379
## ProductAlmond milk	-2.8525515	-1.5573896506
## ProductBanana \$/lb	-5.4799319	-4.2894146000
## ProductBlue Bell Vanilla Ice Cream 16 oz	-3.7520923	-2.1421358570
## ProductCampbells Chicken noodle	-4.1115515	-2.8163896506
## ProductCarton of eggs	-3.5774725	-2.4241176770
## ProductCinnamon Toast Crunch 1lb	-1.8696613	-0.1241717453
## ProductEl Milagros Tortilla Chips	-2.9129671	-1.1651607441
## ProductFrosted Flakes 1 lb	-2.1246613	-0.3791717453
## ProductGold Medal Flour 5 lb	-2.8372300	-1.5046125814
## ProductGood Flow Honey 16 oz	0.2808176	1.7240341201
## ProductGranny Smith Apple \$/lb	-4.3199319	-3.1294146000
## ProductGreek Yogurt	-4.6079636	-3.0970491791
## ProductHigh Brew Black Coffee	-3.6121524	-2.2295143472
## ProductHoney Nut Cheerios	-2.3416352	-1.1094592274
## ProductHorizon 2% Milk Carton	-1.6774725	-0.5241176770
## ProductImperial Sugar	-3.1483411	-1.8157236926
## ProductIodized Salt	-4.4512391	-3.2812048876
## ProductJIF Peanut butter	-3.3245622	-2.1168826179

## ProductJustin's almond butter	6.0836747	7.5268912630
## ProductKind Oats and Honey Bar	-2.5550655	-1.1701652933
## ProductLa Croix Box	-1.7195515	-0.4243896506
## ProductLand o Lakes Half & Half	-3.9644300	-2.6289732430
## ProductLucky Charms 1 lb	-2.3746613	-0.6291717453
## ProductMoms Tomato Sauce	0.7236747	2.1668912630
## ProductNatures Own Whole Wheat Bread	-3.2238381	-1.6152736311
## ProductNavel Orange	-4.6806110	-3.2373944513
## ProductNut Thins 4.25 oz	-3.1963253	-1.7531087370
## ProductOriginal ramen	-5.8118874	-4.3004408731
## ProductPremium Saltine Crackers 1 lb	-3.0518795	-1.6146755310
## ProductProgress Chicken Noodle Soup	-3.7593438	-2.3812397045
## ProductSan Pellegrino 25.3 floz	-4.3177633	-2.9823065764
## ProductSkinny Pop	-2.7046528	-1.3717357209
## ProductSmart Water 23.7 fl oz	-4.3084790	-3.0761838276
## ProductStacy's Pita Chips	-2.4986751	-1.1174141159
## ProductTostitos Bag	-2.4860923	-0.8761358570
## ProductTriscuits 9oz	-2.8861621	-1.6263080570
## ProductWelch's Grape Jelly	-3.5819230	-2.2890645533
## ProductWheat Thins 8oz	-2.8952530	-1.6353989661
## TypeGrocery	-0.9154098	-0.4131031458
## TypeHigh-end Grocery	-0.5944834	-0.0008968566
## TypeNatural	-0.4037250	0.2192581912
## TypeSmall Format	-0.7454724	-0.1428388392

Compared with ordinary grocery stores, convenience stores charge somewhere between .41 and .92 dollars more for the same product.

Part D - Store Linear Model

##	(Intercept)
##	5.75467102
##	Product12 Pack Sprite
##	-0.01833333
##	ProductAlmond milk
##	-2.29296977
##	ProductBanana \$/lb
##	-4.85693618
##	ProductBlue Bell Vanilla Ice Cream 16 oz
##	-3.07796542
##	ProductCampbells Chicken noodle
##	-3.55196977
##	ProductCarton of eggs
##	-2.98094026
##	ProductCinnamon Toast Crunch 1lb
##	-1.17329768
##	ProductEl Milagros Tortilla Chips
##	-1.91049850
##	ProductFrosted Flakes 1 lb
##	-1.42829768
##	ProductGold Medal Flour 5 lb
##	-2.24497040
##	ProductGood Flow Honey 16 oz
##	0.90422020
##	ProductGranny Smith Apple \$/lb

##		-3.69693618
##	ProductGreek Yogurt	
##		-3.93157321
##	ProductHigh Brew Black Coffee	
##		-3.01257661
##	ProductHoney Nut Cheerios	
##		-1.67833193
##	ProductHorizon 2% Milk Carton	
##		-1.08094026
##	ProductImperial Sugar	
##		-2.59735628
##	ProductIodized Salt	
##		-3.85508884
##	ProductJIF Peanut butter	
##		-2.63260723
##	ProductJustin's almond butter	
##		6.70707734
##	ProductKind Oats and Honey Bar	
##		-1.89546566
##	ProductLa Croix Box	
##		-1.15996977
##	ProductLand o Lakes Half & Half	
##		-3.38093292
##	ProductLucky Charms 1 lb	
##		-1.67829768
##	ProductMoms Tomato Sauce	
##		1.34707734
##	ProductNatures Own Whole Wheat Bread	
##		-2.42875040
##	ProductNavel Orange	
##		-4.05720837
##	ProductNut Thins 4.25 oz	
##		-2.57292266
##	ProductOriginal ramen	
##		-5.20079852
##	ProductPremium Saltine Crackers 1 lb	
##		-2.39372509
##	ProductProgress Chicken Noodle Soup	
##		-3.13842212
##	ProductSan Pellegrino 25.3 floz	
##		-3.73426626
##	ProductSkinny Pop	
##		-2.18537924
##	ProductSmart Water 23.7 fl oz	
##		-3.65720625
##	ProductStacy's Pita Chips	
##		-1.91171777
##	ProductTostitos Bag	
##		-1.81196542
##	ProductTriscuits 9oz	
##		-2.12160260
##	ProductWelch's Grape Jelly	
##		-2.81797075
##	ProductWheat Thins 8oz	

```

## -2.13069351
## StoreCentral Market
## -0.57338651
## StoreCVS
## 0.19311241
## StoreFiesta
## -0.70323198
## StoreFresh Plus
## -0.03616437
## StoreH-E-B
## -0.64595932
## StoreKroger
## -0.70331815
## StoreKroger Fresh Fare
## -0.90177969
## StoreNatural Grocers
## -0.08117985
## StoreTarget
## -0.37336967
## StoreWalgreens
## 0.21548328
## StoreWalmart
## -0.99254892
## StoreWheatsville Food Co-Op
## 0.29029303
## StoreWhole Foods
## 0.36415850

```

	2.5 %	97.5 %
## (Intercept)	5.29481829	6.214523748
## Product12 Pack Sprite	-0.58263797	0.545971300
## ProductAlmond milk	-2.88979207	-1.696147469
## ProductBanana \$/lb	-5.40393837	-4.309933984
## ProductBlue Bell Vanilla Ice Cream 16 oz	-3.81973745	-2.336193387
## ProductCampbells Chicken noodle	-4.14879207	-2.955147469
## ProductCarton of eggs	-3.51080489	-2.451075642
## ProductCinnamon Toast Crunch 1lb	-1.97850431	-0.368091042
## ProductEl Milagros Tortilla Chips	-2.72058833	-1.100408677
## ProductFrosted Flakes 1 lb	-2.23350431	-0.623091042
## ProductGold Medal Flour 5 lb	-2.86004284	-1.629897962
## ProductGood Flow Honey 16 oz	0.23900798	1.569432416
## ProductGranny Smith Apple \$/lb	-4.24393837	-3.149933984
## ProductGreek Yogurt	-4.62930236	-3.233844060
## ProductHigh Brew Black Coffee	-3.65021535	-2.374937874
## ProductHoney Nut Cheerios	-2.24361184	-1.113052020
## ProductHorizon 2% Milk Carton	-1.61080489	-0.551075642
## ProductImperial Sugar	-3.21104464	-1.983667913
## ProductIodized Salt	-4.39282443	-3.317353240
## ProductJIF Peanut butter	-3.18794602	-2.077268441
## ProductJustin's almond butter	6.04186513	7.372289559
## ProductKind Oats and Honey Bar	-2.53297768	-1.257953650
## ProductLa Croix Box	-1.75679207	-0.563147469
## ProductLand o Lakes Half & Half	-3.99630165	-2.765564195
## ProductLucky Charms 1 lb	-2.48350431	-0.873091042

## ProductMoms Tomato Sauce	0.68186513	2.012289559
## ProductNatures Own Whole Wheat Bread	-3.17207699	-1.685423804
## ProductNavel Orange	-4.72242059	-3.391996155
## ProductNut Thins 4.25 oz	-3.23813487	-1.907710441
## ProductOriginal ramen	-5.89711766	-4.504479380
## ProductPremium Saltine Crackers 1 lb	-3.05683364	-1.730616540
## ProductProgress Chicken Noodle Soup	-3.77416621	-2.502678040
## ProductSan Pellegrino 25.3 floz	-4.34963499	-3.118897529
## ProductSkinny Pop	-2.79946086	-1.571297623
## ProductSmart Water 23.7 fl oz	-4.22335959	-3.091052907
## ProductStacy's Pita Chips	-2.54783030	-1.275605236
## ProductTostitos Bag	-2.55373745	-1.070193387
## ProductTriscuits 9oz	-2.70212738	-1.541077829
## ProductWelch's Grape Jelly	-3.41187152	-2.224069988
## ProductWheat Thins 8oz	-2.71121828	-1.550168738
## StoreCentral Market	-0.92164719	-0.225125837
## StoreCVS	-0.16684400	0.553068808
## StoreFiesta	-1.23351226	-0.172951704
## StoreFresh Plus	-0.35487988	0.282551136
## StoreH-E-B	-0.94513262	-0.346786025
## StoreKroger	-1.16242453	-0.244211765
## StoreKroger Fresh Fare	-1.36088607	-0.442673303
## StoreNatural Grocers	-0.46989988	0.307540177
## StoreTarget	-0.74706831	0.000328972
## StoreWalgreens	-0.14031581	0.571282360
## StoreWalmart	-1.45165530	-0.533442534
## StoreWheatsville Food Co-Op	-0.06146201	0.642048073
## StoreWhole Foods	0.01672253	0.711594471

According to the model, Whole foods and Wheatsville Food Co-Op are the two most expensive stores, while Walmart and Kroger Fresh Fare were the two cheapest

Part E - Price Discrimination

The confidence intervals of the effect variables for Kroger and Kroger fresh overlap, which means there is not significant evidence that Kroger fresh charges more for the same items.

Part F - Income

##	(Intercept)
##	5.59962615
##	Product12 Pack Sprite
##	-0.01833333
##	ProductAlmond milk
##	-2.11223524
##	ProductBanana \$/lb
##	-4.90781061
##	ProductBlue Bell Vanilla Ice Cream 16 oz
##	-2.90688544
##	ProductCampbells Chicken noodle
##	-3.37123524
##	ProductCarton of eggs
##	-2.97316873
##	ProductCinnamon Toast Crunch 1lb
##	-1.19370026

```

##      ProductEl Milagros Tortilla Chips
##      -2.00120026
##      ProductFrosted Flakes 1 lb
##      -1.44870026
##      ProductGold Medal Flour 5 lb
##      -2.09800296
##      ProductGood Flow Honey 16 oz
##      1.05724624
##      ProductGranny Smith Apple $/lb
##      -3.74781061
##      ProductGreek Yogurt
##      -3.91447530
##      ProductHigh Brew Black Coffee
##      -2.82253771
##      ProductHoney Nut Cheerios
##      -1.69500000
##      ProductHorizon 2% Milk Carton
##      -1.07316873
##      ProductImperial Sugar
##      -2.41348079
##      ProductIodized Salt
##      -3.83677846
##      ProductJIF Peanut butter
##      -2.74689432
##      ProductJustin's almond butter
##      6.86010338
##      ProductKind Oats and Honey Bar
##      -1.68620026
##      ProductLa Croix Box
##      -0.97923524
##      ProductLand o Lakes Half & Half
##      -3.16895861
##      ProductLucky Charms 1 lb
##      -1.69870026
##      ProductMoms Tomato Sauce
##      1.50010338
##      ProductNatures Own Whole Wheat Bread
##      -2.46716528
##      ProductNavel Orange
##      -3.90418234
##      ProductNut Thins 4.25 oz
##      -2.41989662
##      ProductOriginal ramen
##      -4.97745883
##      ProductPremium Saltine Crackers 1 lb
##      -2.24521113
##      ProductProgress Chicken Noodle Soup
##      -3.02102536
##      ProductSan Pellegrino 25.3 floz
##      -3.52229194
##      ProductSkinny Pop
##      -1.95118083
##      ProductSmart Water 23.7 fl oz
##      -3.73454161

```

```
##          ProductStacy's Pita Chips
##          -1.67745026
##          ProductTostitos Bag
##          -1.64088544
##          ProductTriscuits 9oz
##          -2.29159777
##          ProductWelch's Grape Jelly
##          -3.00941495
##          ProductWheat Thins 8oz
##          -2.30068868
##          Income10k
##          -0.01310013

## [1] -0.0302899
```

With an Income coefficient of $-.013$, it shows that as average income increases, the price decreases, which means poorer areas tend to have to pay more for the same items.

A one-standard deviation increase in the income of a ZIP code seems to be associated with a $-.03$ standard-deviation change in the price that consumers in that ZIP code expect to pay for the same product.

Problem 3 - Redlining

- A) True - The R-Squared value of $.516$ between minority percentage and FAIR policy shows that there is a moderate, positive, linear correlation between them. The P-value of the coefficient is also 0 , which further shows the correlation.
- B) False - The R-Squared value of $.061$ between minority percentage and age shows that there is almost no linear correlation between the two. However, there is no test of a interaction in the models, so it could be ambiguous
- C) True/ambiguous - With a coefficient of $-.01$ for minority:fire risklow, it shows that the places with a lower fire risk has a weaker relationship, however not that significant of a value
- D) False - When Income is added to the linear model, the coefficient of the minority variable has a p-value of $.002$, which still shows that it has an affect on FAIR policy rates.
- E) True - The model has an R-Squared value of $.66$, which means that 66 percent of the variation can be explained by the factors of the model. This means that the other 34 percent is due to variation at the zip code level.