

Inflation

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Import Clean Data

Import Price Adjustment Factor

```
H_Clean<-read.csv( file = "C:\\Users\\Hyunkyung Kim\\Desktop\\CKME999\\136\\dataset\\all\\
\\H_clean.csv")
H_Clean$MSSubClass<-as.factor(H_Clean$MSSubClass)
Train<-H_Clean[!is.na(H_Clean$SalePrice),]
Test<-H_Clean[is.na(H_Clean$SalePrice),]
HPAdjustF<-read.csv("C:\\Users\\Hyunkyung Kim\\Desktop\\CKME999\\136\\dataset\\all\\Price
_Adjust.csv")
actual<-read.csv( file = "C:\\Users\\Hyunkyung Kim\\Desktop\\CKME999\\136\\dataset\\all\\
AMES_test.csv")[1461:2919,2]
```

Merge two df & make adjusted column.

```
H_Adjust<-merge(H_Clean,HPAdjustF, by=c('YrSold','MoSold'))
H_Adjust<-H_Adjust[order(H_Adjust$Id),]
H_Adjust<-H_Adjust[,names(H_Adjust)!="observation_date"] # Remove Obs Date
H_Adjust$PriceAdjusted<-H_Adjust$SalePrice/H_Adjust$DivideBy
```

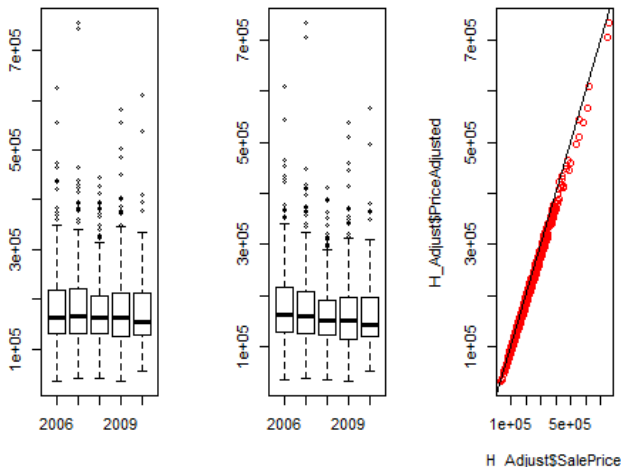
Look at the Pricing Difference.

```
par(mfrow=(c(1,3)))
boxplot(H_Adjust$SalePrice~H_Adjust$YrSold, main='SalePrice VS YearSold')
boxplot(H_Adjust$PriceAdjusted~H_Adjust$YrSold, main='Adjusted SalePrice VS YearSold')
plot(H_Adjust$SalePrice,H_Adjust$PriceAdjusted, col='red')
RMSE(log(H_Adjust$SalePrice[1:1459]),log(H_Adjust$PriceAdjusted[1:1459]))

## [1] 0.06590452

abline(a=0,b=1)
```

SalePrice VS YearSold Adjusted SalePrice VS Yea



Due to inflation, adjusted price is generally lower than the actual price. (The line shows $x=y$)

```
# Remove unnecessary features,
H_Adj_Train<-H_Adjust[,names(H_Adjust)!=c("Id","CPIHOSNS","DivideBy","SalePrice")]
H_Adj_Train<-H_Adj_Train[,names(H_Adj_Train)!="Id"]
H_Adj_Train<-H_Adj_Train[,names(H_Adj_Train)!="SalePrice"]
```

```
Reg<-lm(SalePrice~.,data=H_Clean)
Adjusted<-lm(PriceAdjusted~., data=H_Adj_Train)
```

```
summary(Reg)
```

```
##
## Call:
## lm(formula = SalePrice ~ ., data = H_Clean)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -169595  -11398       43   11494  169595
##
## Coefficients: (3 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -1.479e+06  1.099e+06  -1.347  0.178379
## Id             5.143e-01  1.644e+00   0.313  0.754435
## MSSubClass1NHFin 1.315e+04  1.669e+04   0.788  0.431036
## MSSubClass1NHUnf 1.067e+04  2.812e+04   0.379  0.704513
## MSSubClass1SFA  -8.960e+03  2.460e+04  -0.364  0.715809
## MSSubClass1SNEW  1.088e+04  1.608e+04   0.677  0.498511
## MSSubClass1SOLD  1.195e+04  1.701e+04   0.703  0.482494
## MSSubClass1SPUD  -3.582e+03  1.011e+04  -0.354  0.723102
## MSSubClass2FCNV  2.241e+03  1.381e+04   0.162  0.871118
## MSSubClass2NHS  -1.175e+04  2.058e+04  -0.571  0.568134
## MSSubClass2SNEW  1.655e+04  1.392e+04   1.189  0.234535
## MSSubClass2SOLD  1.744e+04  1.485e+04   1.175  0.240347
## MSSubClassDUPL   9.499e+03  1.302e+04   0.730  0.465692
## MSSubClassMLPUD  -5.016e+03  1.479e+04  -0.339  0.734593
## MSSubClassSPL   -1.265e+03  1.943e+04  -0.065  0.948105
## MSSubClassSPLF   2.073e+03  1.918e+04   0.108  0.913945
## MSZoningFV       3.058e+04  1.284e+04   2.381  0.017411 *
## MSZoningRH       2.783e+04  1.277e+04   2.179  0.029505 *
## MSZoningRL       2.670e+04  1.092e+04   2.445  0.014642 *
## MSZoningRM       2.494e+04  1.030e+04   2.423  0.015541 *
## LotFrontage     9.083e+01  4.423e+01   2.054  0.040215 *
## LotArea          4.052e-01  9.931e-02   4.080  4.78e-05 ***
## StreetPave       2.085e+04  1.233e+04   1.691  0.091010 .
## AlleyNoAlley    -1.519e+03  4.468e+03  -0.340  0.733854
## AlleyPave        5.081e+02  6.478e+03   0.078  0.937497
## LotShapeIR2      1.037e+04  4.407e+03   2.353  0.018798 *
## LotShapeIR3      4.664e+03  9.350e+03   0.499  0.618006
## LotShapeReg      2.449e+03  1.705e+03   1.436  0.151188
## LandContourHLS    1.101e+04  5.448e+03   2.021  0.043527 *
## LandContourLow   -5.108e+03  6.681e+03  -0.764  0.444719
## LandContourLvl    4.943e+03  3.919e+03   1.261  0.207415
## Utilities        1.843e+04  1.011e+04   1.824  0.068458 .
## LotConfigCulDSac  1.184e+04  3.749e+03   3.157  0.001630 **
## LotConfigFR2     -4.278e+03  4.295e+03  -0.996  0.319490
## LotConfigFR3     -1.972e+04  1.342e+04  -1.470  0.141913
## LotConfigInside  -1.294e+02  1.918e+03  -0.067  0.946207
```

## LandSlope	1.932e+02	3.691e+03	0.052	0.958259	
## NeighborhoodBlueste	1.594e+04	2.092e+04	0.762	0.446233	
## NeighborhoodBrDale	9.150e+03	1.217e+04	0.752	0.452259	
## NeighborhoodBrkSide	1.170e+03	9.982e+03	0.117	0.906725	
## NeighborhoodClearCr	-1.123e+04	9.718e+03	-1.155	0.248180	
## NeighborhoodCollgCr	-1.259e+04	7.673e+03	-1.641	0.101141	
## NeighborhoodCrawfor	1.243e+04	9.136e+03	1.360	0.173951	
## NeighborhoodEdwards	-1.430e+04	8.514e+03	-1.680	0.093278	.
## NeighborhoodGilbert	-1.155e+04	8.148e+03	-1.418	0.156528	
## NeighborhoodIDOTRR	-8.119e+03	1.136e+04	-0.715	0.474749	
## NeighborhoodMeadowV	-5.638e+03	1.308e+04	-0.431	0.666576	
## NeighborhoodMitchel	-1.402e+04	8.635e+03	-1.624	0.104580	
## NeighborhoodNames	-1.222e+04	8.295e+03	-1.474	0.140840	
## NeighborhoodNoRidge	1.894e+04	8.932e+03	2.121	0.034128	*
## NeighborhoodNPkVill	1.583e+04	1.475e+04	1.073	0.283461	
## NeighborhoodNridgHt	2.918e+04	7.787e+03	3.747	0.000187	***
## NeighborhoodNWAmes	-1.598e+04	8.521e+03	-1.875	0.060980	.
## NeighborhoodOldTown	-9.265e+03	1.023e+04	-0.905	0.365405	
## NeighborhoodSawyer	-3.575e+03	8.613e+03	-0.415	0.678162	
## NeighborhoodSawyerW	-5.016e+03	8.268e+03	-0.607	0.544118	
## NeighborhoodSomerst	-3.880e+03	9.570e+03	-0.405	0.685211	
## NeighborhoodStoneBr	3.895e+04	8.824e+03	4.414	1.10e-05	***
## NeighborhoodSWISU	-6.392e+03	1.029e+04	-0.621	0.534544	
## NeighborhoodTimber	-9.479e+03	8.626e+03	-1.099	0.272014	
## NeighborhoodVeenker	1.174e+03	1.110e+04	0.106	0.915774	
## Condition1Feedr	3.142e+03	5.268e+03	0.596	0.550960	
## Condition1Norm	1.402e+04	4.372e+03	3.208	0.001371	**
## Condition1PosA	6.221e+03	1.065e+04	0.584	0.559189	
## Condition1PosN	8.880e+03	7.852e+03	1.131	0.258321	
## Condition1RRAE	-1.426e+04	9.255e+03	-1.541	0.123601	
## Condition1RRAN	1.500e+04	7.335e+03	2.045	0.041071	*
## Condition1RRNE	-8.415e+03	1.869e+04	-0.450	0.652633	
## Condition1RRNN	1.158e+04	1.355e+04	0.855	0.392943	
## Condition2Feedr	-1.501e+04	2.678e+04	-0.560	0.575255	
## Condition2Norm	-2.060e+04	2.368e+04	-0.870	0.384540	
## Condition2PosA	3.631e+04	3.687e+04	0.985	0.324975	
## Condition2PosN	-2.386e+05	3.085e+04	-7.736	2.11e-14	***
## Condition2RRAE	-1.038e+05	7.539e+04	-1.378	0.168591	
## Condition2RRAN	-1.554e+04	3.485e+04	-0.446	0.655755	
## Condition2RRNN	-1.095e+04	3.028e+04	-0.362	0.717744	
## BldgType	3.288e+03	3.734e+03	0.880	0.378850	
## HouseStyle1.5Unf	1.231e+04	2.374e+04	0.519	0.604125	
## HouseStyle1Story	1.357e+04	9.359e+03	1.449	0.147462	
## HouseStyle2.5Fin	1.279e+03	1.803e+04	0.071	0.943464	
## HouseStyle2.5Unf	8.696e+03	1.675e+04	0.519	0.603847	
## HouseStyle2Story	-9.388e+03	8.600e+03	-1.092	0.275241	
## HouseStyleSFoyer	6.435e+03	1.248e+04	0.516	0.606249	
## HouseStyleSLvl	1.753e+04	1.462e+04	1.199	0.230654	
## OverallQual	8.262e+03	1.077e+03	7.673	3.39e-14	***
## OverallCond	5.362e+03	9.115e+02	5.883	5.17e-09	***
## YearBuilt	2.745e+02	9.012e+01	3.045	0.002373	**
## YearRemodAdd	1.718e+01	5.763e+01	0.298	0.765612	
## RoofStyleGable	2.444e+03	1.929e+04	0.127	0.899201	
## RoofStyleGambrel	3.569e+03	2.110e+04	0.169	0.865694	
## RoofStyleHip	5.798e+03	1.935e+04	0.300	0.764442	

## RoofStyleMansard	1.131e+04	2.252e+04	0.503	0.615405	
## RoofStyleShed	7.282e+04	3.977e+04	1.831	0.067335	.
## RoofMatlCompShg	6.756e+05	3.579e+04	18.878	< 2e-16	***
## RoofMatlMembran	7.294e+05	4.864e+04	14.996	< 2e-16	***
## RoofMatlMetal	6.994e+05	4.885e+04	14.317	< 2e-16	***
## RoofMatlRoll	6.576e+05	4.477e+04	14.687	< 2e-16	***
## RoofMatlTar&Grv	6.704e+05	4.091e+04	16.390	< 2e-16	***
## RoofMatlWdShake	6.519e+05	3.937e+04	16.558	< 2e-16	***
## RoofMatlWdShngl	7.572e+05	3.737e+04	20.261	< 2e-16	***
## Exterior1stAsphShn	-1.853e+04	3.504e+04	-0.529	0.597061	
## Exterior1stBrkComm	-1.506e+04	2.947e+04	-0.511	0.609494	
## Exterior1stBrkFace	7.935e+03	1.348e+04	0.588	0.556305	
## Exterior1stCBlock	1.715e+02	2.704e+04	0.006	0.994940	
## Exterior1stCemntBd	-6.026e+03	1.995e+04	-0.302	0.762698	
## Exterior1stHdBoard	-9.454e+03	1.362e+04	-0.694	0.487620	
## Exterior1stImStucc	-3.692e+04	2.976e+04	-1.241	0.215020	
## Exterior1stMetalSd	4.416e+02	1.545e+04	0.029	0.977200	
## Exterior1stPlywood	-1.501e+04	1.345e+04	-1.116	0.264825	
## Exterior1stStone	1.005e+03	2.533e+04	0.040	0.968345	
## Exterior1stStucco	1.226e+03	1.479e+04	0.083	0.933948	
## Exterior1stVinylSd	-1.100e+04	1.425e+04	-0.772	0.440327	
## Exterior1stWd Sdng	-9.412e+03	1.305e+04	-0.721	0.471035	
## Exterior1stWdShing	-2.732e+03	1.415e+04	-0.193	0.846905	
## Exterior2ndAsphShn	8.498e+03	2.348e+04	0.362	0.717472	
## Exterior2ndBrk Cmn	1.275e+04	2.168e+04	0.588	0.556437	
## Exterior2ndBrkFace	3.424e+02	1.380e+04	0.025	0.980208	
## Exterior2ndCBlock	NA	NA	NA	NA	
## Exterior2ndCmentBd	1.416e+04	1.956e+04	0.724	0.469394	
## Exterior2ndHdBoard	3.078e+03	1.291e+04	0.238	0.811590	
## Exterior2ndImStucc	2.357e+04	1.501e+04	1.570	0.116612	
## Exterior2ndMetalSd	1.060e+03	1.496e+04	0.071	0.943535	
## Exterior2ndOther	-2.522e+04	2.891e+04	-0.873	0.383102	
## Exterior2ndPlywood	4.893e+03	1.254e+04	0.390	0.696484	
## Exterior2ndStone	-7.027e+03	1.800e+04	-0.390	0.696379	
## Exterior2ndStucco	-6.874e+03	1.430e+04	-0.481	0.630952	
## Exterior2ndVinylSd	7.985e+03	1.362e+04	0.586	0.557668	
## Exterior2ndWd Sdng	6.349e+03	1.244e+04	0.510	0.609836	
## Exterior2ndWd Shng	-2.487e+03	1.311e+04	-0.190	0.849536	
## MasVnrTypeBrkFace	6.616e+03	7.066e+03	0.936	0.349255	
## MasVnrTypeNone	1.326e+04	7.112e+03	1.864	0.062586	.
## MasVnrTypeStone	1.302e+04	7.511e+03	1.733	0.083310	.
## MasVnrArea	3.274e+01	6.078e+00	5.387	8.57e-08	***
## ExterQual	4.642e+03	2.227e+03	2.084	0.037328	*
## ExterCond	-3.149e+03	2.241e+03	-1.405	0.160308	
## FoundationCBlock	3.495e+03	3.358e+03	1.041	0.298188	
## FoundationPConc	4.986e+03	3.629e+03	1.374	0.169660	
## FoundationSlab	1.502e+04	9.595e+03	1.566	0.117669	
## FoundationStone	6.368e+03	1.184e+04	0.538	0.590716	
## FoundationWood	-2.969e+04	1.577e+04	-1.882	0.060030	.
## BsmtQual	3.488e+03	1.805e+03	1.932	0.053563	.
## BsmtCond	-5.369e+03	2.263e+03	-2.373	0.017804	*
## BsmtExposure	5.198e+03	8.957e+02	5.804	8.22e-09	***
## BsmtFinType1	-1.209e+02	5.371e+02	-0.225	0.821883	
## BsmtFinSF1	3.604e+01	5.094e+00	7.076	2.48e-12	***
## BsmtFinType2	-1.565e+02	1.371e+03	-0.114	0.909137	

## BsmtFinSF2	2.400e+01	8.611e+00	2.788	0.005392	**
## BsmtUnfSF	1.565e+01	4.599e+00	3.402	0.000689	***
## TotalBsmtSF	NA	NA	NA	NA	
## HeatingGasA	-7.769e+03	2.664e+04	-0.292	0.770642	
## HeatingGasW	-1.095e+04	2.740e+04	-0.400	0.689496	
## HeatingGrav	-5.481e+03	2.864e+04	-0.191	0.848255	
## HeatingOthW	-4.643e+04	3.283e+04	-1.415	0.157459	
## HeatingWall	-5.123e+02	3.087e+04	-0.017	0.986762	
## HeatingQC	1.135e+03	1.014e+03	1.119	0.263417	
## CentralAirY	-1.248e+03	4.054e+03	-0.308	0.758190	
## ElectricalFuseF	-2.134e+03	6.088e+03	-0.350	0.726024	
## ElectricalFuseP	1.835e+03	1.801e+04	0.102	0.918854	
## ElectricalMix	1.009e+04	2.747e+04	0.367	0.713406	
## ElectricalSBkr	-4.335e+03	3.163e+03	-1.371	0.170761	
## X1stFlrSF	4.612e+01	5.693e+00	8.102	1.28e-15	***
## X2ndFlrSF	6.353e+01	5.987e+00	10.610	< 2e-16	***
## LowQualFinSF	2.007e+01	1.969e+01	1.019	0.308312	
## GrLivArea	NA	NA	NA	NA	
## BsmtFullBath	1.743e+03	2.071e+03	0.842	0.400158	
## BsmtHalfBath	3.706e+02	3.186e+03	0.116	0.907437	
## FullBath	3.122e+03	2.319e+03	1.346	0.178442	
## HalfBath	2.896e+03	2.216e+03	1.307	0.191416	
## BedroomAbvGr	-5.821e+03	1.461e+03	-3.985	7.15e-05	***
## KitchenAbvGr	-1.304e+04	6.440e+03	-2.025	0.043043	*
## KitchenQual	7.230e+03	1.734e+03	4.169	3.27e-05	***
## TotRmsAbvGrd	3.078e+03	1.001e+03	3.075	0.002151	**
## Functional	5.789e+03	1.199e+03	4.830	1.54e-06	***
## Fireplaces	6.012e+03	2.329e+03	2.582	0.009948	**
## FireplaceQu	-1.583e+03	8.426e+02	-1.879	0.060455	.
## GarageTypeAttchd	1.361e+04	1.164e+04	1.169	0.242747	
## GarageTypeBasement	2.204e+04	1.358e+04	1.623	0.104861	
## GarageTypeBuiltIn	1.483e+04	1.217e+04	1.218	0.223507	
## GarageTypeCarPort	1.654e+04	1.516e+04	1.090	0.275707	
## GarageTypeDetchd	1.876e+04	1.162e+04	1.615	0.106549	
## GarageTypeNoGarage	4.253e+04	1.633e+04	2.604	0.009313	**
## GarageYrBlt	-2.253e+01	6.323e+01	-0.356	0.721648	
## GarageFinish	7.262e+02	1.274e+03	0.570	0.568925	
## GarageCars	5.018e+03	2.375e+03	2.113	0.034793	*
## GarageArea	1.488e+01	8.289e+00	1.796	0.072815	.
## GarageQual	5.796e+03	4.052e+03	1.430	0.152898	
## GarageCond	-1.421e+03	4.196e+03	-0.339	0.734956	
## PavedDrive	-1.384e+02	1.744e+03	-0.079	0.936786	
## WoodDeckSF	1.297e+01	6.176e+00	2.099	0.035979	*
## OpenPorchSF	1.094e+01	1.219e+01	0.897	0.369867	
## EnclosedPorch	9.334e-02	1.320e+01	0.007	0.994358	
## X3SsnPorch	3.908e+01	2.375e+01	1.645	0.100171	
## ScreenPorch	4.370e+01	1.308e+01	3.341	0.000861	***
## PoolArea	-4.270e+01	5.753e+01	-0.742	0.458103	
## PoolQC	2.497e+04	8.840e+03	2.825	0.004809	**
## FenceGdWo	1.007e+04	5.179e+03	1.945	0.052026	.
## FenceMnPrv	1.106e+04	4.218e+03	2.623	0.008816	**
## FenceMnWw	6.135e+03	8.683e+03	0.707	0.479996	
## FenceNoFence	9.437e+03	3.842e+03	2.456	0.014173	*
## MiscFeatureNoMiscFeature	2.065e+04	1.043e+05	0.198	0.843144	
## MiscFeatureOthr	5.061e+04	9.443e+04	0.536	0.592087	

```
## MiscFeatureShed      2.175e+04  9.982e+04   0.218 0.827524
## MiscFeatureTenC     -5.185e+04  9.752e+04  -0.532 0.595046
## MiscVal              1.242e+00  6.546e+00   0.190 0.849511
## MoSold               -7.182e+02  2.583e+02  -2.780 0.005512 **
## YrSold               -2.452e+01  5.371e+02  -0.046 0.963602
## SaleTypeCon          2.796e+04  1.875e+04   1.491 0.136223
## SaleTypeConLD        1.558e+04  1.039e+04   1.499 0.134165
## SaleTypeConLI        4.800e+03  1.230e+04   0.390 0.696481
## SaleTypeConLw       -9.725e+02  1.264e+04  -0.077 0.938682
## SaleTypeCWD          1.714e+04  1.364e+04   1.256 0.209366
## SaleTypeNew          3.415e+04  1.622e+04   2.106 0.035427 *
## SaleTypeOth          9.353e+03  1.555e+04   0.602 0.547522
## SaleTypeWD           2.967e+02  4.444e+03   0.067 0.946769
## SaleConditionAdjLand  1.176e+04  1.534e+04   0.767 0.443453
## SaleConditionAlloca   6.797e+03  9.230e+03   0.736 0.461644
## SaleConditionFamily   -2.886e+02  6.483e+03  -0.045 0.964508
## SaleConditionNormal    7.391e+03  3.052e+03   2.422 0.015568 *
## SaleConditionPartial  -8.085e+03  1.559e+04  -0.519 0.604081
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 24320 on 1244 degrees of freedom
## (1459 observations deleted due to missingness)
## Multiple R-squared:  0.9201, Adjusted R-squared:  0.9063
## F-statistic: 66.64 on 215 and 1244 DF,  p-value: < 2.2e-16
```

summary(Adjusted)

```
##
## Call:
## lm(formula = PriceAdjusted ~ ., data = H_Adj_Train)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -155879  -10943        0   10914  155879
##
## Coefficients: (3 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.667e+06  1.044e+06   4.469 8.57e-06 ***
## YrSold        -3.030e+03  5.105e+02  -5.935 3.80e-09 ***
## MoSold        -1.042e+03  2.454e+02  -4.245 2.35e-05 ***
## MSSubClass1NHFin  1.101e+04  1.587e+04   0.694 0.487868
## MSSubClass1NHUnf  9.647e+03  2.672e+04   0.361 0.718140
## MSSubClass1SFA   -1.272e+04  2.339e+04  -0.544 0.586495
## MSSubClass1SNEW   9.627e+03  1.528e+04   0.630 0.528813
## MSSubClass1SOLD   1.051e+04  1.617e+04   0.650 0.515965
## MSSubClass1SPUD   -3.405e+03  9.606e+03  -0.354 0.723085
## MSSubClass2FCONV  1.395e+03  1.313e+04   0.106 0.915348
## MSSubClass2NHS   -1.072e+04  1.953e+04  -0.549 0.583354
## MSSubClass2SNEW   1.418e+04  1.323e+04   1.072 0.283994
## MSSubClass2SOLD   1.450e+04  1.411e+04   1.027 0.304393
## MSSubClassDUPL    8.402e+03  1.237e+04   0.679 0.497233
## MSSubClassMLPUD   -5.429e+03  1.406e+04  -0.386 0.699487
## MSSubClassSPL     -3.718e+03  1.847e+04  -0.201 0.840497
## MSSubClassSPLF    6.251e+02  1.823e+04   0.034 0.972648
## MSZoningFV       2.588e+04  1.221e+04   2.120 0.034180 *
```

## MSZoningRH	2.246e+04	1.213e+04	1.851	0.064375	.
## MSZoningRL	2.242e+04	1.038e+04	2.160	0.030943	*
## MSZoningRM	2.081e+04	9.784e+03	2.127	0.033618	*
## LotFrontage	8.404e+01	4.204e+01	1.999	0.045801	*
## LotArea	3.547e-01	9.430e-02	3.761	0.000177	***
## StreetPave	2.033e+04	1.172e+04	1.735	0.083050	.
## AlleyNoAlley	-8.007e+02	4.246e+03	-0.189	0.850465	
## AlleyPave	2.131e+02	6.156e+03	0.035	0.972396	
## LotShapeIR2	1.083e+04	4.189e+03	2.586	0.009832	**
## LotShapeIR3	4.507e+03	8.877e+03	0.508	0.611765	
## LotShapeReg	2.420e+03	1.620e+03	1.494	0.135538	
## LandContourHLS	1.025e+04	5.178e+03	1.980	0.047978	*
## LandContourLow	-4.429e+03	6.351e+03	-0.697	0.485660	
## LandContourLvl	4.324e+03	3.725e+03	1.161	0.245973	
## Utilities	1.782e+04	9.605e+03	1.855	0.063801	.
## LotConfigCulDSac	1.155e+04	3.560e+03	3.243	0.001215	**
## LotConfigFR2	-4.076e+03	4.078e+03	-1.000	0.317693	
## LotConfigFR3	-1.897e+04	1.274e+04	-1.489	0.136860	
## LotConfigInside	-5.875e+02	1.819e+03	-0.323	0.746778	
## LandSlope	5.982e+02	3.506e+03	0.171	0.864564	
## NeighborhoodBlueste	1.236e+04	1.989e+04	0.621	0.534392	
## NeighborhoodBrDale	6.236e+03	1.157e+04	0.539	0.589899	
## NeighborhoodBrkSide	-8.311e+02	9.488e+03	-0.088	0.930217	
## NeighborhoodClearCr	-1.231e+04	9.237e+03	-1.332	0.182975	
## NeighborhoodCollgCr	-1.314e+04	7.294e+03	-1.802	0.071829	.
## NeighborhoodCrawfor	1.026e+04	8.684e+03	1.181	0.237799	
## NeighborhoodEdwards	-1.477e+04	8.093e+03	-1.825	0.068181	.
## NeighborhoodGilbert	-1.184e+04	7.744e+03	-1.528	0.126663	
## NeighborhoodIDOTRR	-9.855e+03	1.079e+04	-0.913	0.361319	
## NeighborhoodMeadowV	-5.737e+03	1.243e+04	-0.461	0.644546	
## NeighborhoodMitchel	-1.502e+04	8.207e+03	-1.831	0.067391	.
## NeighborhoodNames	-1.312e+04	7.885e+03	-1.663	0.096475	.
## NeighborhoodNoRidge	1.670e+04	8.485e+03	1.968	0.049239	*
## NeighborhoodNPkVill	1.470e+04	1.402e+04	1.048	0.294701	
## NeighborhoodNridgHt	2.689e+04	7.399e+03	3.634	0.000291	***
## NeighborhoodNWAmes	-1.651e+04	8.096e+03	-2.040	0.041610	*
## NeighborhoodOldTown	-1.025e+04	9.725e+03	-1.054	0.292121	
## NeighborhoodSawyer	-4.384e+03	8.186e+03	-0.536	0.592340	
## NeighborhoodSawyerW	-5.644e+03	7.859e+03	-0.718	0.472779	
## NeighborhoodSomerst	-4.352e+03	9.095e+03	-0.478	0.632389	
## NeighborhoodStoneBr	3.559e+04	8.386e+03	4.244	2.36e-05	***
## NeighborhoodSWISU	-7.675e+03	9.778e+03	-0.785	0.432639	
## NeighborhoodTimber	-9.760e+03	8.198e+03	-1.191	0.234064	
## NeighborhoodVeenker	-3.415e+02	1.055e+04	-0.032	0.974184	
## Condition1Feedr	2.150e+03	5.006e+03	0.429	0.667689	
## Condition1Norm	1.274e+04	4.155e+03	3.067	0.002209	**
## Condition1PosA	6.515e+03	1.012e+04	0.644	0.519909	
## Condition1PosN	6.290e+03	7.463e+03	0.843	0.399526	
## Condition1RRAE	-1.385e+04	8.797e+03	-1.574	0.115706	
## Condition1RRAN	1.465e+04	6.972e+03	2.101	0.035852	*
## Condition1RRNe	-9.217e+03	1.776e+04	-0.519	0.603960	
## Condition1RRNn	1.262e+04	1.288e+04	0.980	0.327259	
## Condition2Feedr	-1.318e+04	2.544e+04	-0.518	0.604652	
## Condition2Norm	-1.829e+04	2.251e+04	-0.813	0.416636	
## Condition2PosA	2.444e+04	3.504e+04	0.698	0.485620	

## Condition2PosN	-2.272e+05	2.932e+04	-7.747	1.94e-14	***
## Condition2RRAE	-1.033e+05	7.164e+04	-1.442	0.149517	
## Condition2RRAN	-1.511e+04	3.313e+04	-0.456	0.648380	
## Condition2RRNn	-1.039e+04	2.876e+04	-0.361	0.718052	
## BldgType	3.326e+03	3.549e+03	0.937	0.348980	
## HouseStyle1.5Unf	1.101e+04	2.256e+04	0.488	0.625480	
## HouseStyle1Story	1.344e+04	8.887e+03	1.512	0.130822	
## HouseStyle2.5Fin	-3.345e+03	1.713e+04	-0.195	0.845234	
## HouseStyle2.5Unf	5.865e+03	1.591e+04	0.369	0.712437	
## HouseStyle2Story	-8.449e+03	8.171e+03	-1.034	0.301327	
## HouseStyleSFoyer	7.307e+03	1.186e+04	0.616	0.538075	
## HouseStyleSLvl	1.810e+04	1.390e+04	1.303	0.192916	
## OverallQual	7.989e+03	1.022e+03	7.816	1.15e-14	***
## OverallCond	4.850e+03	8.664e+02	5.598	2.66e-08	***
## YearBuilt	2.496e+02	8.554e+01	2.918	0.003580	**
## YearRemodAdd	1.840e+01	5.472e+01	0.336	0.736717	
## RoofStyleGable	5.288e+03	1.833e+04	0.288	0.773064	
## RoofStyleGambrel	5.346e+03	2.005e+04	0.267	0.789820	
## RoofStyleHip	8.300e+03	1.839e+04	0.451	0.651795	
## RoofStyleMansard	1.296e+04	2.140e+04	0.606	0.544839	
## RoofStyleShed	7.634e+04	3.779e+04	2.020	0.043584	*
## RoofMatlCompShg	6.361e+05	3.401e+04	18.702	< 2e-16	***
## RoofMatlMembran	6.853e+05	4.622e+04	14.827	< 2e-16	***
## RoofMatlMetal	6.636e+05	4.640e+04	14.300	< 2e-16	***
## RoofMatlRoll	6.173e+05	4.256e+04	14.505	< 2e-16	***
## RoofMatlTar&Grv	6.326e+05	3.888e+04	16.271	< 2e-16	***
## RoofMatlWdShake	6.149e+05	3.741e+04	16.435	< 2e-16	***
## RoofMatlWdShngl	7.190e+05	3.552e+04	20.245	< 2e-16	***
## Exterior1stAsphShn	-1.213e+04	3.330e+04	-0.364	0.715620	
## Exterior1stBrkComm	-9.187e+03	2.801e+04	-0.328	0.742986	
## Exterior1stBrkFace	9.326e+03	1.281e+04	0.728	0.466914	
## Exterior1stCBlock	3.129e+03	2.567e+04	0.122	0.903024	
## Exterior1stCemntBd	-5.971e+03	1.896e+04	-0.315	0.752921	
## Exterior1stHdBoard	-7.886e+03	1.294e+04	-0.609	0.542404	
## Exterior1stImStucc	-2.766e+04	2.828e+04	-0.978	0.328269	
## Exterior1stMetalSd	2.435e+03	1.468e+04	0.166	0.868312	
## Exterior1stPlywood	-1.286e+04	1.279e+04	-1.005	0.314860	
## Exterior1stStone	1.417e+02	2.408e+04	0.006	0.995304	
## Exterior1stStucco	1.181e+03	1.406e+04	0.084	0.933055	
## Exterior1stVinylSd	-7.368e+03	1.354e+04	-0.544	0.586414	
## Exterior1stWd Sdng	-6.850e+03	1.241e+04	-0.552	0.580989	
## Exterior1stWdShing	-1.274e+03	1.345e+04	-0.095	0.924540	
## Exterior2ndAsphShn	7.147e+03	2.231e+04	0.320	0.748786	
## Exterior2ndBrk Cmn	9.079e+03	2.060e+04	0.441	0.659510	
## Exterior2ndBrkFace	-1.419e+03	1.312e+04	-0.108	0.913870	
## Exterior2ndCBlock	NA	NA	NA	NA	
## Exterior2ndCmentBd	1.279e+04	1.859e+04	0.688	0.491613	
## Exterior2ndHdBoard	1.613e+03	1.227e+04	0.131	0.895416	
## Exterior2ndImStucc	1.912e+04	1.427e+04	1.340	0.180376	
## Exterior2ndMetalSd	-1.447e+03	1.421e+04	-0.102	0.918922	
## Exterior2ndOther	-2.319e+04	2.748e+04	-0.844	0.398932	
## Exterior2ndPlywood	3.204e+03	1.192e+04	0.269	0.788132	
## Exterior2ndStone	-7.763e+03	1.711e+04	-0.454	0.650024	
## Exterior2ndStucco	-7.759e+03	1.360e+04	-0.571	0.568372	
## Exterior2ndVinylSd	4.341e+03	1.294e+04	0.335	0.737307	

## Exterior2ndWd Sdng	3.636e+03	1.182e+04	0.308	0.758459	
## Exterior2ndWd Shng	-4.460e+03	1.246e+04	-0.358	0.720375	
## MasVnrTypeBrkFace	6.513e+03	6.716e+03	0.970	0.332325	
## MasVnrTypeNone	1.259e+04	6.758e+03	1.864	0.062624	.
## MasVnrTypeStone	1.115e+04	7.135e+03	1.562	0.118490	
## MasVnrArea	3.030e+01	5.775e+00	5.247	1.82e-07	***
## ExterQual	3.868e+03	2.113e+03	1.831	0.067391	.
## ExterCond	-2.635e+03	2.130e+03	-1.237	0.216319	
## FoundationCBlock	3.360e+03	3.192e+03	1.053	0.292673	
## FoundationPConc	4.366e+03	3.449e+03	1.266	0.205815	
## FoundationSlab	1.433e+04	9.121e+03	1.571	0.116484	
## FoundationStone	7.417e+03	1.125e+04	0.659	0.509781	
## FoundationWood	-2.387e+04	1.499e+04	-1.592	0.111563	
## BsmtQual	3.106e+03	1.714e+03	1.812	0.070190	.
## BsmtCond	-4.615e+03	2.147e+03	-2.149	0.031800	*
## BsmtExposure	5.089e+03	8.509e+02	5.981	2.90e-09	***
## BsmtFinType1	-1.950e+02	5.103e+02	-0.382	0.702349	
## BsmtFinSF1	3.373e+01	4.841e+00	6.967	5.23e-12	***
## BsmtFinType2	-1.776e+02	1.301e+03	-0.136	0.891457	
## BsmtFinSF2	2.215e+01	8.184e+00	2.707	0.006888	**
## BsmtUnfSF	1.440e+01	4.370e+00	3.294	0.001015	**
## TotalBsmtSF	NA	NA	NA	NA	
## HeatingGasA	-6.534e+03	2.531e+04	-0.258	0.796379	
## HeatingGasW	-1.061e+04	2.604e+04	-0.407	0.683796	
## HeatingGrav	-3.868e+03	2.722e+04	-0.142	0.887015	
## HeatingOthW	-4.456e+04	3.120e+04	-1.428	0.153528	
## HeatingWall	7.479e+02	2.934e+04	0.025	0.979669	
## HeatingQC	9.603e+02	9.640e+02	0.996	0.319333	
## CentralAirY	-1.377e+03	3.854e+03	-0.357	0.720877	
## ElectricalFuseF	-2.183e+03	5.787e+03	-0.377	0.706100	
## ElectricalFuseP	2.589e+02	1.710e+04	0.015	0.987920	
## ElectricalMix	9.634e+03	2.611e+04	0.369	0.712201	
## ElectricalSBrkr	-4.116e+03	3.005e+03	-1.370	0.171007	
## X1stFlrSF	4.498e+01	5.411e+00	8.311	2.45e-16	***
## X2ndFlrSF	6.232e+01	5.690e+00	10.951	< 2e-16	***
## LowQualFinSF	2.366e+01	1.871e+01	1.265	0.206079	
## GrLivArea	NA	NA	NA	NA	
## BsmtFullBath	1.798e+03	1.968e+03	0.914	0.361063	
## BsmtHalfBath	-6.432e+01	3.028e+03	-0.021	0.983059	
## FullBath	2.740e+03	2.204e+03	1.243	0.214075	
## HalfBath	2.211e+03	2.105e+03	1.050	0.293715	
## BedroomAbvGr	-5.441e+03	1.389e+03	-3.918	9.40e-05	***
## KitchenAbvGr	-1.212e+04	6.117e+03	-1.982	0.047743	*
## KitchenQual	6.858e+03	1.646e+03	4.166	3.32e-05	***
## TotRmsAbvGrd	2.697e+03	9.510e+02	2.836	0.004639	**
## Functional	5.449e+03	1.139e+03	4.783	1.94e-06	***
## Fireplaces	5.804e+03	2.212e+03	2.624	0.008789	**
## FireplaceQu	-1.558e+03	8.004e+02	-1.946	0.051860	.
## GarageTypeAttchd	1.206e+04	1.106e+04	1.090	0.275725	
## GarageTypeBasement	1.955e+04	1.289e+04	1.517	0.129602	
## GarageTypeBuiltIn	1.323e+04	1.157e+04	1.143	0.253157	
## GarageTypeCarPort	1.443e+04	1.441e+04	1.001	0.317072	
## GarageTypeDetchd	1.695e+04	1.104e+04	1.535	0.124982	
## GarageTypeNoGarage	3.955e+04	1.552e+04	2.548	0.010969	*
## GarageYrBlt	-2.415e+01	6.005e+01	-0.402	0.687637	

```

## GarageFinish          4.637e+02  1.211e+03  0.383 0.701926
## GarageCars           5.107e+03  2.257e+03  2.263 0.023834 *
## GarageArea           1.157e+01  7.876e+00  1.468 0.142225
## GarageQual           6.299e+03  3.852e+03  1.635 0.102233
## GarageCond          -1.757e+03  3.987e+03 -0.441 0.659534
## PavedDrive           -7.201e+01  1.658e+03 -0.043 0.965364
## WoodDeckSF           1.332e+01  5.869e+00  2.270 0.023405 *
## OpenPorchSF          1.075e+01  1.159e+01  0.928 0.353822
## EnclosedPorch        -8.956e-02  1.254e+01 -0.007 0.994305
## X3SsnPorch           3.421e+01  2.257e+01  1.516 0.129800
## ScreenPorch          3.946e+01  1.243e+01  3.174 0.001541 **
## PoolArea             -3.120e+01  5.468e+01 -0.571 0.568300
## PoolQC               2.230e+04  8.398e+03  2.655 0.008029 **
## FenceGdWo            9.850e+03  4.923e+03  2.001 0.045621 *
## FenceMnPrv           1.084e+04  4.007e+03  2.705 0.006925 **
## FenceMnWw            5.865e+03  8.253e+03  0.711 0.477472
## FenceNoFence         9.278e+03  3.652e+03  2.541 0.011181 *
## MiscFeatureNoMiscFeature 1.295e+04  9.908e+04  0.131 0.896045
## MiscFeatureOthr       4.721e+04  8.968e+04  0.526 0.598666
## MiscFeatureShed       1.509e+04  9.481e+04  0.159 0.873599
## MiscFeatureTenC      -5.380e+04  9.259e+04 -0.581 0.561273
## MiscVal              6.498e-01  6.219e+00  0.104 0.916796
## SaleTypeCon           2.540e+04  1.783e+04  1.425 0.154415
## SaleTypeConLD         1.393e+04  9.875e+03  1.411 0.158505
## SaleTypeConLI         5.637e+03  1.168e+04  0.483 0.629527
## SaleTypeConLw        -1.081e+03  1.201e+04 -0.090 0.928306
## SaleTypeCWD           1.577e+04  1.296e+04  1.217 0.223817
## SaleTypeNew           3.571e+04  1.541e+04  2.317 0.020680 *
## SaleTypeOth           8.352e+03  1.475e+04  0.566 0.571451
## SaleTypeWD            1.158e+03  4.222e+03  0.274 0.783868
## SaleConditionAdjLand   1.111e+04  1.458e+04  0.762 0.446412
## SaleConditionAlloca    5.202e+03  8.770e+03  0.593 0.553192
## SaleConditionFamily    -3.884e+02  6.162e+03 -0.063 0.949750
## SaleConditionNormal    6.480e+03  2.901e+03  2.234 0.025667 *
## SaleConditionPartial  -8.837e+03  1.481e+04 -0.597 0.550900
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 23110 on 1245 degrees of freedom
## (1459 observations deleted due to missingness)
## Multiple R-squared:  0.9193, Adjusted R-squared:  0.9054
## F-statistic: 66.28 on 214 and 1245 DF,  p-value: < 2.2e-16

```

Compare RMSE.

```

aa<-predict(Adjusted,newdata=H_Adj_Train[1461:2919,-80])

## Warning in predict.lm(Adjusted, newdata = H_Adj_Train[1461:2919, -80]):
## prediction from a rank-deficient fit may be misleading

bb<-as.data.frame(cbind(H_Adj_Train[1461:2919,-80],aa))
bb$Id<-1461:2919

bb_check<-merge(bb,H_PAdjustF, by=c('YrSold','MoSold'))
bb_check<-bb_check[order(bb_check$Id),]
bb_check$OrigPrice<-bb_check$aa*bb_check$DivideBy

```

```
a1<-predict(Reg,newdata=H_Clean[1461:2919,])  
## Warning in predict.lm(Reg, newdata = H_Clean[1461:2919, ]): prediction from  
## a rank-deficient fit may be misleading  
  
RMSE(a1,actual)  
## [1] 29449.55  
  
RMSE(log(a1), log(actual))  
## [1] 0.1831513  
  
RMSE(bb_check$OrigPrice, actual)  
## [1] 29632.69  
  
RMSE(log(bb_check$OrigPrice),log(actual))  
## [1] 0.1823925
```

RMSLE without price adjustment is 0.1831 where with CPI adjustment is 1.824. It is better but marginally.