### Japanese longline CPUE for albacore tuna in the northwestern Pacific Ocean standardized by Generalized Linear Model using operational catch and effort data from 1966 to 2011<sup>1</sup>

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<sup>&</sup>lt;sup>1</sup>This working paper was submitted to the ISC Albacore Working Group Intercessional Workshop, 19-26 March 2013, held at the College of Marine Sciences, Shanghai Ocean University, Shanghai, China. Document not to be cited without author's permission.

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#### Abstract

Japanese longline CPUE for albacore tuna in the northwestern Pacific Ocean was standardized up to 2011 by GLM (CPUE-LogNormal error structured model). Number of hooks between float (NHF) was applied into the model to standardize the change of the catchability which has been derived by fishing gear configuration. SST (Sea Surface Temperature) was applied in the model as oceanographic factor. Quarter based and year based CPUEs were obtained from Ismeans of year and that of year-quarter interaction.

CPUE in real scale of distant water and offshore longline declined sharply from 8 in 1966 to 4 in 1971, and kept at the same level until 1991 when it increased steeply again and kept at around 11 until 2001. After that, it decreased to 5 in 2003 and 2004, after when it increased again to around 8 with some fluctuation. As for the CPUE of the small longline, it increased from 9 in 1994 to 12 in 1999 after when it has fluctuated between 6 and 9. If these CPUEs are overlaid in the relative scale in which average from 1994 to 2011 is 1.0, they showed similar trends except some differences in small peaks. Using final model selected for Log-normal model was applied to Negative Binomial model for comparison. CPUEs standardized by each model showed very similar trend each other.

By applying vessel identification into log-normal model as explanatory variable, historical change in fishing power was estimated. In the case of distant water and offshore longline, relative fishing power estimated which was around 0.5 in 1979, gradually increased to about 1.2 in 1998 and kept at the similar level thereafter fluctuating between 1.1 and 1.2. Estimated fishing power for small longline has not showed large change and kept in around 1.0 since it has shown very slight increasing trend.

#### 1. Introduction

Japanese longline CPUE for albacore tuna was standardized by Generalized Linear Model up to 2011. In the previous assessment of North Pacific albacore conducted in 2011, Japanese longline CPUE was standardized based on the catch and effort data aggregated to year, month, 5 degree latitude, 5 degree longitude and the number of hooks between float.

By reviewing the last stock assessment, several recommendations were issued to improve this assessment. Since the importance to understand the historical change in catchability was recognized, it is difficult to estimate it. In this study, operational catch and effort data was used to apply vessel identification characteristics into to GLM model in order to estimate the catchability trend. This method was firstly introduced by Hoyle (2009). This method was applied into Japanese longline fishery (Hoyle et al., 2010, Hoyle and Okamoto, 2011) and has utilized for actual BET stock assessment at WCPFC since 2010 (Harley et al., 2010, Davies et al., 2011).

#### 2. Materials and methods

#### 1) Catch and effort data used

Two series of Japanese longline operational based catch and effort statistics, the data for small longlin fishery (10 - 20 GRT) from 1994 to 2011 and that for offshore (principally, 20-

120 GRT) and distant water (larger than 120 GRT) longline fisheries from 1966 to 2011, were used. Analyzed area (Fig. 1) was the same as that used in Ijima et al. (2013) which covers the area ranged from  $15^{\circ}$ N to  $40^{\circ}$ N and from  $130^{\circ}$ E to  $180^{\circ}$  from which a main albacore catch has been caught at the North Pacific Ocean by Japanese longline fishery. As the back ground information, the number of operation by catch in number per each longline set was presented as histograms in Appendix Fig. 1 by fishery type (distant water and offshore longline and small longline), period of years (1952-1974, 1975-1990, 1991-2002 and 2003-2011) and quarter in 5° latitude by 10° longitude 10 resolution.

Operational based data is data of each longline operation, and includes detail information of each operation (date, noon position, sea surface temperature, catch in number of each species, the number of hooks used, the number of hooks between float, etc.) and that of vessel and cruise (name of vessel, call sign, date of start and end of the cruise, etc.). However, these information does not necessarily cover for all years analyzed. As for the NHF, for example, this information is available from 1975 and call sign which was used as vessel identification is available from 1979.

#### 2) Standardization by GLM (Generalized Linear Model)

CPUE based on the catch in number was used. CPUE is calculated as "the number of caught fish / the number of hooks \* 1000" As the model for standardizing CPUE, CPUE-LogNormal error structured model was mainly used. The followings are the full model applied and 10 sorts of models with different combination of explanatory variables were tried.

# - Full Model for Year based CPUE standardization in the analyzed area in the North Pacific Ocean from 1966 to 2011 for distant water and offshore longline fishery (from 1994 to 2011 for small longline fishery)

 $Log (CPUE+const) = \mu + YR + QT + F-type + NHFCL + LL5 + SST + YR*QT$ 

Where Log: natural logarithm,

CPUE : catch in number of bigeye per 1000 hooks,

Const: 10% of overall mean of CPUE

 $\mu$ : overall mean,

YR: effect of year,

QT: effect of fishing season (quarter)

F-type: effect of fishery type (distant water and offshore longline fisheries),

NHFCL : effect of gear type (category of the number of hooks between floats),

LL5: effect of 5 degree of latitude and 5 degree longitude square as category,

SST: effect of sea surface temperature,

YR\*QT : interaction term between year and quarter,

e : error term.

All explanatory variables showed above, were applied into the model as class variable. Basing on the result of ANOVA (type III SS), non-significant effects were removed in stepwise from the initial model based on the F-value (p<0.05). In the 10 models tested, the best model was selected based on the AIC value (Akaike's Information Criteria, Akaike 1973).

As environmental factor, which are available for the analyzed period from 1966 to 2011, SST (Sea Surface Temperature) was applied into the model as class variable in 1 degree resolution. This Global Sea Surface Temperatures (COBE-SST) is the data whose resolution is 1-degree latitude and 1-degree longitude by month, and the data from 1966 to 2011 was downloaded from NEAR-GOOS Regional Real Time Data Base of Japan Meteorological Agency (JMA).

http://goos.kishou.go.jp/rrtdb/database.html

The number of hooks between float (NHF) is the important indicator of targeting for longline operation. As this information is available since 1975 as explained before, NHF for the period from 1966 to 1974 is assumed to be 5., Three types of classification of NHF, that is, NHFCL A, B and C were tested using the following model and the best classification to be used for the main analyses was selected by AIC value.

 $Log (CPUE+const) = \mu + YR + QT + NHFCL (Three types)$ 

Where three types of NHFCL tested are

- NHFCL\_A NHF (number of hooks between float from 5 to 21) was used without classification.
- NHFCL\_B NHFCL 1: 5-6, NHFCL 2: 7-9, NHFCL 3: 10-13, NHFCL 4: 14-17, NHFCL 5: 18-21
- NHFCL\_C NHFCL1: 5-10, NHFCL 2: 11-16, NHFCL3: 17-21.

Year based and quarter based CPUE index were obtained from lsmeans output of year and year-quarter interaction, respectively.

#### 3) Estimation of change in catchability

In this paper, a term 'fishing power' is used to represent catchability, but does not include oceanographic effect into the considerations. Historical change in fishing power was estimated by applying vessel identification characteristics into the GLM model as an explanatory variable for distant water and offshore longline from 1979 to 2011 and for small longlin from 1994 to 2011. Used models for this analysis were as follows.

Std CPUE without vessel effect: Log (CPUE+const) =  $\mu$  + YR + QT Std CPUE with vessel effect: Log (CPUE+const) =  $\mu$  + YR + QT+ Vessel Identification

As the identification of each vessel, call sign (available only from 1979) was used for distant water and offshore longline, and vessel name was used for small longline fleet.

Each index was normalized so as time series average is equal 1.0. By dividing index from model without vessel effect by index from model including vessel effect, historical change in fishing power was estimated. Models which include NHF were also applied to know the effect of NHF in the fishing power estimated by vessel identification.

#### 4) Negative Binomial Model

Negative Binomial error structure assumption was applied for comparison with the result from log-normal model. Same set of explanatory variables with those included in the best model for log-normal model were applied in to the negative binomial model. Basic structure of the model was as follows.

E[Catch] = Effort \* exp(Intercept + each explanatory valuables)where, Catch ~ Negative Binomial( $\alpha, \beta$ )

#### 3. Results and discussion

#### 1) Selection of NHF classification

Trends of distant water and offshore longline CPUE standardized by the three models with different types of NHFCL (A, B and C) was Shown in Fig. 2. Declining trend from 1966 to 1980 is strongest for NHFCL\_B and weakest for NHFCL\_C and intermediate for NHFCL\_A, and opposite order is true for increasing trend thereafter. In the AIC values derived from models with different type of NHFCL classifications was smallest for NHFCL\_A, and largest

for NHFCL\_C (Table 1), and it was determined to apply NHFCL\_A (NHF as it is without classification) for main standardization analyses.

Same analyses were conducted also for small longline fishery. There were not remarkable difference between CPUE trends derived from models in which three difference NHF classifications were applied. As was the case of distant water and offshore longline, AIC value was smallest for the model with NHFCL\_A and largest for NHFCL\_C. Therefore NHFCL\_A was applied for the main CPUE standardization of small longline, too.

The gear configuration is very important factor to standardize targeting in the longline operation. However, this NHF has used in longline operation historically changed depending on change in main target species and development of fishing method and gear including material of them even in the same area and for same target species. Although it was determined that NHF (number of hooks between floats) without classification is applied into the model basing on the results of above analyses, it might be necessary to consider further improve to standardize the targeting.

#### 2) Standardization

The albacore CPUEs (catch in number per 1000 hooks) in year and quarter bases were standardized for the period from 1966 (1994 for small longline) to 2011 by GLM (CPUE-LogNormal error structured model) separately for offshore and distant longline and small longline fisheries. In 10 models listed in Table 2, effects of all explanatory variables included were significant for both fisheries as shown in ANOVA results in Table 3. In the models tested, Model 110 showed smallest value in AIC for both longline fishery groups (Table 2). Therefore, Model 110 was selected as the best model for both fishing groups. Distributions of the standard residual derived from Model 110 were shown in Fig. 3 as histogram and QQ plot and that from all models were shown in Appendix Fig. 2, Distribution of residual of Model 110 did not show remarkable difference from the normal distribution for both of distant water and offshore longline and small longline fisheries.

#### 3) CPUE trend observed

Historical trends of CPUE standardized applying Model 110 were shown in Fig. 4 for distant weater and offshore longlineand small longline fisheries in real and relative scales, overlaying with nominal CPUE. CPUE in real scale of distant water and offshore longline declined sharply from 8 in 1966 to 4 in 1971, and kept at the same level until 1991 when it increased steeply again and kept at around 11 until 2001. After that, it decreased to 5 in 2003 and 2004, after when it increased again to around 8 with some fluctuation. As for the CPUE of the small longline, it increased from 9 in 1994 to 12 in 1999 after when it has fluctuated between 6 and 9. Distant water and offshore longline CPUE and small longline CPUE in relative scale expressing the average from 1994 to 2011 is 1.0 were overlaid in Fig. 5. Both CPUE showed similar trends except some differences in small peaks.

Historical trends of quarter based CPUE standardized using Model 110 were shown in Fig. 6. Since the quarter based CPUE showed strong seasonal oscillation, total trend seems to be similar to that of year based CPUE.

#### 4) Effect of each explanatory variables

Fig. 7 showed trend of standardized CPUE derived each model to observe the effect of each explanatory variable on the standardized CPUE trend. In the case of offshore and distant water longline, Model 100 in which only Year is included showed large difference in CPUE trend before 1985 from nominal CPUE. Before 1985, nominal CPUE showed remarkable declining trend while that of the Model 100 also showed declining trend until 1971 and rather slight increasing trend thereafter.

Model 101 (YR+QT), 102 (YR+QT+F-Type), 104 (YR+QT+LL5), 105 (YR+QT+SST) showed basically similar trend with that of Model 100, that is, increasing trend from 1971 to 1999 and once declined to about half level in 2003 and increased again thereafter. On the other hand, by applying NHF in the model (Model 103), increasing trend was weakened to some extent.

Fig. 8 shows effects of each explanatory variable applied in the model 110 (YR+ QT+ F-Type+ NHF+ LL5+ SST+ YR\*QT) for distant water and offshore longline and small longline fishery. As the data of small longline includes only one fishery type (small LL) then there is not figure of F-type. In the fishing season, effect was clearly higher in 1st and 4th quarters than 2nd and 3rd quarters for both of distant water and offshore longline and small longline fisheries. Regarding Fishery type (F-type), offshore longline showed higher effect than distant water longline. This difference in F-type between distant water and offshore longlines would be reasonable because most of longliner which seasonally targeting albacore are offshore and small longline fisheries. In the effect of NHF, basically larger NHF showed higher effect for both fisheries. SST showed peak of effect at 19 and 20°C for distant water and offshore longline, and at 17-19 °C for small longline fisheries. Since quite high peak exist around 13°C, confidence interval is quite wide.

#### 5) Estimation of historical change in fishing power

By applying vessel identification into the model as an explanatory variable, historical change in fishing power was estimated. Effect of vessel identification is thought to be average fishing ability of each vessel existing in each period. If ratio of vessel with high ability is high in one period, averaged fishing power in the period should be high, and vice versa. Standardized CPUEs derived from model with vessel identification and that from model without it for distant water and offshore longline and small longline were shown in Fig. 9 (left). In the Fig. 9 (right), historical change in fishing power estimated as the ratio of CPUEs from models with and without vessel identification was presented. In the case of distant water and offshore longline, relative fishing power estimated which was around 0.5 in 1979, gradually increased to about 1.2 in 1998 and kept at the similar level thereafter fluctuating between 1.1 and 1.2. Estimated fishing power for small longline has not showed remarkable change throughout analyzed period and been kept in around 1.0 since it has shown very slight increasing trend.

Fishing power would change affected by many kind of factors such as fishing devices equipped on the vessel, fishing gear, skill of fishing master, targeting, etc. Especially, targeting is thought to be important factor. In this study, NHF (the number of hooks between float) was applied to standardize the change in catchability derived from change in targeting and gear configuration. Therefore, it is supposed that a part of change in catchability estimated by vessel effect could be explained by NHF. Then, CPUE was standardized by the Models including Year, Quarter, NHF with (Model 203) and without (Model 203) vessel identification were calculated and ratio of these CPUE (Model 103 / Model 203) was also observed (Fig. 10). In the case of distant water and offshore longline, the ratio of both models is around 1.0 throughout the analyzed period fluctuating between 0.9 and 1.1. This ratio was around 1.0 also for small longline fishery. These results indicate that the effects of vessel identification and that of NHF behave very similarly in the standardization, and standardization of catchability by using vessel identification would be able to be achieved by NHF.

Many of factors which affect on the fishing power, for example fishing master and targeting could change in much shorter period than longevity of the vessel. However, as this fishing ability of each vessel was estimated as average from appearing to disappearing of the vessel in the analyzed period, the estimated value of ability of each vessel is fixed through time and does not change in this analysis. It is desirable to develop more flexible indicator to estimate the change in fishing power through the time.

#### 6) Attempt to apply alternative model for standardization

As alternative model, Catch model with Negative Binomial error structure assumption (N-Bin model) was also applied for comparison. Same set of explanatory factors used in Model 110 were applied to N-Bin model. All effects of explanatory variables included in the model were significant for both fishery groups (Table 4). The trends of the standardized CPUE applying N-Bin model were shown in Fig. 11 overlaid with those from Model 110 applying CPUE-LogNormal error structured model for comparison. Their trends were principally very similar each other except for that the fluctuation during the period from 1970 to 1990 for distant water and offshore longlin is stronger in N-Bin model.

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le fisheries.				
Types	Model No.		Ν	AIC
DW & OS	Model_103	YR + QT + NHFCL_A	641920	1898131
DW & OS	Model_103	YR + QT + NHFCL_B	641920	1904571
DW & OS	Model_103	YR + QT + NHFCL_C	641920	1932605
Small	Model_103	YR + QT + NHFCL_A	416837	1107261
Small	Model_103	YR + QT + NHFCL_B	416837	1110411
Small	Model_103	YR + QT + NHFCL_C	416837	1112768

Table 1. AIC values derived from models with different classification of NHFCL (class of the number of hooks between float) for distant water and offshore longline and small longline fisheries.

Table 2. Tested models with different combination of explanatory variables and resulted AIC values derived from each model for distant water and offshore longline and small longline fisheries.

Types	Model No.			Ν	AIC
DW & OS	Model_100	YR		641920	2077186.2
DW & OS	Model_101	YR + QT		641920	1945606.5
DW & OS	Model_102	YR + QT + F-Type		641920	1945562.8
DW & OS	Model_103	YR + QT	+ NHF	641920	1898131.0
DW & OS	Model_104	YR + QT	+ LL5	641920	1860606.7
DW & OS	Model_105	YR + QT	+ SST	641920	1880053.1
DW & OS	Model_106	YR + QT + F-Type	+ NHF	641920	1898036.6
DW & OS	Model_107	YR + QT + F-Type	+ NHF + LL5	641920	1819564.4
DW & OS	Model_108	YR + QT + F-Type	+ NHF + LL5 + SST	641920	1766936.6
DW & OS	Model_109	YR + QT + F-Type	+ NHF + LL5 + YR*QT	641920	1782117.8
DW & OS	Model_110	YR + QT + F-Type	+ NHF + LL5 + SST + YR*QT	641920	1732059.7
Small	Model_100	YR		416837	1312883.5
Small	Model_101	YR + QT		416837	1113618.5
Small	Model_103	YR + QT	+ NHF	416837	1107261.3
Small	Model_104	YR + QT	+ LL5	416837	1043650.7
Small	Model 005	YR + QT	+ SST	416837	1047057.6
Small	Model_107	YR + QT	+ NHF + LL5	416837	1036339.9
Small	Model 108	YR + QT	+ NHF + LL5 + SST	416837	982357.6
Small	Model_109	YR + QT	+ NHF + LL5 + YR*QT	416837	1015555.9
Small	Model_110	YR + QT	+ NHF + LL5 + SST + YR*QT	416837	961270.2

## Table 3. Results of ANOVA from all model tested for distant water and offshore longline and small longline fisheries.

Distant v RUN_100		<b>nd offshor</b> 1966-2011 Ye					RUN_100		1994-2011 Ye	ar base			
Source	DF	Type III SS	Mean Square	F Value	Pr > F		Source	DF	Type III SS	Mean Square	F Value	Pr > F	<b>ID A</b>
Model Error	45 641874	97530.282 955599.642	2167.340 1.489	1455.80	<.0001	R-Square= 0.09261	Model Error	17 416819	9821.938 569275.561	577.761 1.366	423.03	<.0001	R-Square= 0.01696
	011071	000000.012				CV =			000270.001				CV =
YR	45	97530.282	2167.340	1455.80	<.0001	73.25852	YR	17	9821.938	577.761	423.03	<.0001	50.5901
RUN_101		1966-2011 Ye		E Malua	Du \ E		RUN_101		<u>1994-2011 Ye</u>		F Value	Du \ E	
Source Model	48	Type III SS 274643.604	Mean Square 5721.742	F Value 4717.64	Pr > F <.0001	R-Square=	Source Model	20	Type III SS 226153.429	Mean Square 11307.671	13354.00	Pr > F <.0001	R-Square
Error	641871	778486.320	1.213			0.260788	Error	416816	352944.070	0.847			0.39052
YR	45	125999.701	2799.993	2308.63	<.0001	CV = 66.12211	YR	17	12993.386	764.317	902.63	<.0001	CV = 39.8344
QT	43	177113.322	59037.774	48677.30	<.0001	00.12211	QT	3	216331.491	72110.497		<.0001	39.0344
RUN_102		1966-2011 Ye	ar base										
Source			Mean Square	F Value	Pr > F	1							
Model Error	49 641870	274699.026 778430.897	5606.103 1.213	4622.62	<.0001	R-Square= 0.260841							
Enor	041070	//0400.00/	1.210			CV =							
YR	45	126053.621	2801.192	2309.78 48477.60	<.0001	66.1198							
QT F-Type	3 1	176374.366 55.423	58791.455 55.423	48477.60 45.70	<.0001 <.0001								
RUN_103		1966-2011 Ye	ar base				RUN_103		1994-2011 Ye	ar base			
Source	DF	Type III SS	Mean Square	F Value	Pr > F		Source		Type III SS	Mean Square	F Value	Pr > F	
Model	50	290257.846	5805.157	4884.37	<.0001	R-Square=	Model	22	226876.029	10312.547	12203.70	<.0001	R-Square
Error	641869	762872.078	1.189			0.275614 CV =	Error	416814	352221.470	0.845			0.39177 CV =
YR	45	43147.962	958.844	806.76	<.0001	65.45574	YR	17	13685.522	805.031		<.0001	39.7937
QT NHFCL	3	176036.981 15614.242	58678.994 7807.121	49371.60 6568.79	<.0001 <.0001		QT NHFCL	3	215193.662 722.600	71731.221 361.300	84885.70 427.56	<.0001 <.0001	
				0308.79	1.0001						427.30	1.0001	
RUN_104 Source		<u>1966-2011 Ye</u> Type III SS	ar base Mean Square	F Value	Pr≻F		RUN_104 Source		<u>1994-2011 Ye</u> Type III SS	Mean Square	F Value	Pr > F	
Model	97	371297.567	3827.810	3603.19	<.0001	R-Square=	Model	60	280748.613	4679.144	6536.49	<.0001	R-Square
Error	641822	681832.357	1.062			0.352566 CV =	Error	416776	298348.887	0.716			0.48480 CV =
YR	45	96412.551	2142.501	2016.78	<.0001	61.88374	YR	17	11125.478	654.440	914.21	<.0001	36.6259
QT	3	116604.441	38868.147	36587.30	<.0001		QT	3	65293.689	21764.563	30403.80	<.0001	
LL5	49	96653.963	1972.530	1856.78	<.0001		LL5	40	54595.184	1364.880	1906.66	<.0001	
RUN_105		1966-2011 Ye		E Mahaa	Pr > F		RUN_105		<u>1994-2011 Ye</u>	ar base Mean Square	E Malua	Pr > F	
Source Model	67	Type III SS 346222.910	Mean Square 5167.506	F Value 4706.98	<.0001	R-Square=	Source Model	39	Type III SS 278023.424	Mean Square 7128.806	F Value 9873.72	<.0001	R-Square
Error	640230	702869.613	1.098			0.330021	Error	416660	300827.722	0.722			0.48030
	45	122849.059	2729.979	2486.68	<.0001	CV = 62.77837	YR	17	14807.432	871.025	1206.41	<.0001	CV = 36.7823
VP	40	101717.991	33905.997	30884.30	<.0001	02.77637	QT	3	105044.097	35014.699		<.0001	30.7623
YR QT	3							19	51944.137	2733.902	3786.58	<.0001	
YR QT SST	3 19	73099.342	3847.334	3504.46	<.0001		SST	10	51544.157	2700.002	0700.00		
QT SST	19		3847.334		<.0001		SST	13	51544.157	2700.002	0700.00		
QT SST RUN_106 Source	19 DF	73099.342 1966-2011 Ye Type III SS	3847.334 arbase Mean Square	3504.46 F Value	<.0001 Pr > F		<u> </u>	19	51344.157	2700.002	0700.00		
QT SST RUN_106 Source Model	19 DF 65	73099.342 1966-2011 Ye Type III SS 330286.480	<u>3847.334</u> ar base <u>Mean Square</u> 5081.330	3504.46	<.0001	R-Square=	<u> </u>	13	01044.107	2700.002	0700.00		
QT SST RUN_106 Source	19 DF	73099.342 1966-2011 Ye Type III SS	3847.334 arbase Mean Square	3504.46 F Value	<.0001 Pr > F	R-Square= 0.313624 CV =	<u> </u>		51344.137	2700.302	0700.00		
QT SST RUN_106 Source Model Error YR	19 DF 65 641854 45	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040	<u>3847.334</u> ar base <u>Mean Square</u> 5081.330 1.126 651.334	3504.46 F Value 4512.00 578.36	<.0001 Pr > F <.0001 <.0001	0.313624	<u>SST</u>	13	51544.157	2700.002	0700.00		
QT SST RUN_106 Source Model Error YR QT	19 DF 65 641854	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656	<u>3847.334</u> ar base <u>Mean Square</u> 5081.330 1.126 651.334 56363.219	3504.46 F Value 4512.00 578.36 50048.10	<.0001 Pr > F <.0001	0.313624 CV =	<u>SST</u>		51544.157	2700.002	0700.00		
QT SST RUN_106 Source Model Error YR	19 DF 65 641854 45 3	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040	<u>3847.334</u> ar base <u>Mean Square</u> 5081.330 1.126 651.334	3504.46 F Value 4512.00 578.36	<.0001 Pr > F <.0001 <.0001 <.0001	0.313624 CV =	<u>SST</u>		51544.157	2700.002	0700.00		
QT SST RUN_106 Source Model Error YR QT F-Type NHF RUN_107	19 DF 65 641854 45 3 1 16	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV =	<u>RUN_107</u>		1994–2011 Ye	ear base			
QT SST RUN_106 Source Model Error YR QT F-Type NHF RUN_107 Source	19 DF 65 641854 45 3 1 16 DF	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS	3847.334 ar base 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 Pr > F Pr > F	0.313624 CV = 63.71608	RUN_107 Source	DF	1994-2011 Ye Type III SS	ar base Mean Square	F Value	Pr ≻ F	R-Square
QT SST RUN_106 Source Model Error YR QT F-Type NHF RUN_107	19 DF 65 641854 45 3 1 16	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV = 63.71608 R-Square= 0.392697	<u>RUN_107</u>		1994–2011 Ye	ear base			0.4938
QT SST RUIN_106 Source Model Error YR QT F-Type NHF RUN_107 Source Model Error	19 DF 65 641854 45 3 1 1 16 DF 114 641805	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 Pr > F <.0001	0.313624 CV = 63.71608 R-Square= 0.392697 CV =	RUN_107 Source Model Error	DF 76 416760	1994–2011 Ye Type III SS 285958.136 293139.363	ar base Mean Square 3762.607 0.703	<u>F Value</u> 5349.35	Pr > F <.0001	0.4938 CV =
QT SST Nodel Error YR QT F-Type NHF Source Source Error Model Error YR	19 DF 65 641854 45 3 1 1 16 DF 114 641805 45	73099.342 1966-2011 Ye Type III SS 330266.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 Pr > F <.0001 <.0001	0.313624 CV = 63.71608 R-Square= 0.392697	RUN_107 Source Model Error YR	<u>DF</u> 76 416760 17	1994–2011 Ye Type III SS 285958.136 293139.363 11650.753	ar base <u>Mean Square</u> 3762.607 0.703 685.338	F Value 5349.35 974.35	Pr > F <.0001 <.0001	0.4938 CV =
QT SST Source Model Error YR QT F-Type Model Error NHF Model Error NHF Type	19 DF 65 641854 45 3 1 1 16 0 F 114 641805 45 3 1	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 413561.289 639568.634 30911.729 106996.531 564.546	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV = 63.71608 R-Square= 0.392697 CV =	RUN_107 Source Model Error YR QT	DF 76 416760 17 3	1994–2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794	ar base Mean Square 3762.607 0.703 685.338 20565.931	F Value 5349.35 974.35 29238.80	Pr ≥ F <.0001 <.0001	0.4938 CV =
QT SST Source Model Error YR QT F-Type NHF Source KUN107 Source YR QT F-Type F-Type F-Type NHFCL	19 DF 65 641854 45 3 1 1 641805 DF 114 641805 45 3 1 1 16	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV = 63.71608 R-Square= 0.392697 CV =	RUN_107 Source Bodel Error YR QT NHFCL	DF 76 416760 17 3 16	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523	ear base Mean Square 3762.607 0.703 685.338 20565.931 325.595	F Value 5349.35 974.35 29238.80 462.90	Pr ≥ F <.0001 <.0001 <.0001	0.4938 CV =
QT SST Source Model Error YR QT F-Type NHF RUN 107 Source Model Error YR QT YR QT F-Type NHFCL LL5	19 DF 65 641854 45 3 1 16 0 F 114 641805 45 3 1 1 16 49	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 83274.810	3847.334 Ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 564.546 565.312 1699.486	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV = 63.71608 R-Square= 0.392697 CV =	RUN_107 Source Model Error YR QT NHFCL LL5	DF 76 416760 17 3 16 40	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142	ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904	F Value 5349.35 974.35 29238.80	Pr ≥ F <.0001 <.0001 <.0001	0.4938 CV =
QT SST RUN_106 Source Model Error YR QT F-Type Model Error YR QT F-Type NHFCL LL5 RUN_108	19 DF 65 641854 45 3 1 16 DF 114 641805 45 3 1 16 49	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 106996.531 564.546 40564.994 83274.810 1966-2011 Ye	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base	3504.46 F Value 4512.00 5078.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV = 63.71608 R-Square= 0.392697 CV =	RUN_107 Source Model Error QT NHFCL LL5 RUN_108	DF 76 416760 17 3 16 40	1994–2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966–2011 Ye	ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 ar base	F Value 5349.35 974.35 29238.80 462.90 1934.81	Pr ≥ F <.0001 <.0001 <.0001 <.0001	0.4938 CV =
QT SST Source Model Error YR QT F-Type NHF RUN 107 Source Model Error YR QT YR QT F-Type NHFCL LL5	19 DF 65 641854 45 3 1 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 405564.994 83274.810 1966-2011 Ye Type III SS 459901.864	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 5686.927 35665.510 564.546 25353.312 1699.486 ar base Mean Square 3457.909	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5	DF 76 416760 17 3 16 40 DF 95	1994–2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966–2011 Ye Type III SS 321342.748	ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 ar base Mean Square 3382.555	F Value 5349.35 974.35 29238.80 462.90	Pr > F <.0001 <.0001 <.0001 <.0001 Pr > F	0.4938 CV = 36.305
QT SST RUN_108 Source Model Error YR QT F-Type NHF Source Source Model Error YR QT F-Type NHFCL LL5 Source NHFCL	19 DF 65 641854 45 3 1 16 DF 114 641805 45 3 3 1 16 45 45 45 9 DF DF DF DF DF DF DF DF DF DF	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 106996.531 564.546 40564.994 83274.810 1966-2011 Ye 1966-2011 Ye Type III SS	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 108.545.540 564.546 2535.312 1699.486 ar base	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value	$\begin{array}{c} <,0001 \\ \hline Pr > F \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0000 \\ <,0$	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source	DF 76 416760 17 3 16 40 0 DF	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 1966-2011 Ye	ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 ar base Mean Square	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value	Pr > F <.0001 <.0001 <.0001 <.0001 Pr > F	0.4938 CV = 36.305 R-Square 0.55513
QT SST RUN_106 Source Model Error VR QT F-Type Model Error YR QT F-Type NHFCL LL5 RUN_108 Source Model	19 DF 65 641854 45 3 1 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330266.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 105986.531 30911.729 106996.531 564.546 40564.994 83274.810 1966-2011 Ye 1966-2011 Ye 589190.659	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value	$\begin{array}{c} <,0001 \\ \hline \\ Pr > F \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,0001 \\ <,00001 \\ <,00001 \\ <,000000 \\ <,00000 \\ <,00000 \\ <,0000 \\ <,00$	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model	DF 76 416760 17 3 16 40 DF 95	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398	ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 rar base Mean Square 3382.555 0.618	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390	Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 Pr > F <.0001	0.4938 CV = 36.305 R-Square 0.55513 CV =
QT SST RUN_108 Source Model Error RUN_107 Source Model Error YR QT F-Type NHFCL LL5 RUN_108 Source Model Error YR QT YR QT	19 DF 65 641854 45 3 1 1 641805 45 3 1 1 641805 45 3 1 1 640164 45 3 3	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 459901.864 40564.994 83274.810 1066-2011 Ye Type III SS 459901.865 30276.373 37977.138	3847,334 ar base Mean Square 5081,330 1.126 651,334 56363,219 108,881 3474,216 ar base Mean Square 3627,731 0.997 666,927 35665,510 564,546 2535,312 169,486 ar base Mean Square 3457,909 0.920 672,808 12659,046	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20	<.0001 Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001 <.0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error	DF 76 416760 17 3 16 40 DF 95 416604	1994–2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966–2011 Ye Type III SS 321342.748	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 <u>Mean Square</u> <u>3382.555</u> 0.618 811.525	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value	Pr > F <.0001 <.0001 <.0001 <.0001 <.0001 Pr > F <.0001 <.0001	0.4938 CV = 36.305 R-Square 0.55513 CV =
QT SST RUL_106 Source Model Error NHF RUL_107 Source Model Error YR QT F-Type NHFCL LL5 RUL_108 Source NHFCL LL5 RUL_108 Source Tror F-Type	19 DF 65 641854 45 3 1 16 DF 114 641805 45 3 1 16 49 DF 133 640164 45 3 1 1 16 49 133 16 133 16 133 16 133 16 133 16 133 16 133 16 16 133 16 16 16 16 16 16 16 16 16 16	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 10596.531 1564.546 40564.994 83274.810 1966-2011 Ye 459901.864 569190.659 30276.373 37977.138 766.759	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT	DF 76 416760 17 3 16 40 DF 95 416604 17 3	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212	ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Mean Square 3382.555 0.618 811.525 4988.737	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910	Pr > F     Construction       <.0001	0.4938 CV = 36.305 R-Square 0.55513 CV =
QT <u>SST</u> <u>Source</u> Model Error YR QT F-Type NHF <u>Source</u> Model Error YR QT F-Type NHFCL <u>Source</u> Model Error YR QT F-Type NHFC <u>Source</u> NHFC <u>Source</u> NHFCL	19 DF 641854 45 3 1 1 641805 45 3 3 1 1 641805 45 3 3 1 1 640164 45 3 3 1 1 133 3 640164 45 133 3 640164	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 10596.531 564.546 40564.994 43274.810 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 459901.864 559190.659 30276.373 37977.138 786.759 39373.543	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL	DF 76 416760 17 3 16 40 95 5 416604 17 3 16	1994–2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966–2011 Ye Type III SS 321342.748 257508.398 13795.929 14966.212 3777.839	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 <u>Mean Square</u> 3382.555 0.618 811.525 4988.737 236.115	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990	$Pr > F \\ < 0001$ < 0001 < 0001 < 0001 < 0001 < 0001 < 0001 < 0001 < 0001 < 0001	0.4938 CV = 36.305 R-Square 0.55513 CV =
QT SST RUN_106 Source Model Error YR QT F-Type NHF RUN_107 Source YR QT F-Type NHFCL LL5 RUN_108 Source NHFCL LL5 RUN_108 Source Tror YR QT F-Type	19 DF 65 641854 45 3 1 16 DF 114 641805 45 3 1 16 49 DF 133 640164 45 3 1 1 16 49 133 16 133 16 133 16 133 16 133 16 133 16 133 16 16 133 16 16 16 16 16 16 16 16 16 16	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 10596.531 1564.546 40564.994 83274.810 1966-2011 Ye 459901.864 569190.659 30276.373 37977.138 766.759	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT	DF 76 416760 17 3 16 40 DF 95 416604 17 3	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 <u>Mean Square</u> 3382.555 0.618 811.525 4988.737 236.115	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990	Pr > F     Construction       <.0001	0.4938 CV = 36.305 R-Square 0.55513 CV =
QT SST RUN_106 Source Model Error YR QT F-Type NHFC LL5 Source YR QT F-Type NHFCL LL5 SSTCL RUN_109	19 DF 641854 45 3 1 16 0F 114 641805 45 3 1 1 640164 45 3 3 640164 45 3 1 1 16 49 133 3 640164	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 639568.634 30911.729 106996.531 564.546 40564.994 83274.810 1966-2011 Ye 1990.1864 589190.859 30276.373 37977.138 786.759 39373.543 60159.638 49514.10012 1966-2011 Ye	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3657.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 266.005 ar base	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19	1994–2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966–2011 Ye 1996–2011 Ye 13795.929 14966.212 3777.839 38792.511 34577.89004 1994–2011 Ye	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 tar base <u>Mean Square</u> 3382.555 0.618 811.525 4988.737 236.115 969.813 1866.205 tar base	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2	Pr > F       <0001	0.4938 CV = 36.305 R-Square 0.55513 CV =
QT SST RUN_106 Source Model Error YR QT F-Type NHF QT F-Type NHFCL LL5 Source Model Error YR QT F-Type NHFCL LL5 SSTCL SSTCL RUN_109 Source	19 DF 65 641854 45 3 1 16 0F 114 641805 45 3 1 16 49 0F 133 640164 45 3 1 16 49 0F 0F 133 16 45 3 1 16 16 49 0F 0F 0F 0F 0F 0F 0F 0F 0F 0F	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 83274.810 1966-2011 Ye Type III SS 786.759 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 30276.373 3037.543 60159.638 49514.10012 1966-2011 Ye	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 666.927 35665.510 564.546 2535.312 169.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value F Value	<0001 Pr > F (0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source YR QT NHFCL LL5 SST RUN_109 Source	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 9 5 416604	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye Type III SS 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 1994-2011 Ye	ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Mean Square 3382.555 0.618 811.525 4988.737 236.115 969.813 1866.205 rar base Mean Square	F Value 5349.35 974.35 29238.80 462.90 1334.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value	Pr ≥ F       <0001	0.4938 CV = 36.305 0.55513 CV = 34.0333
QT SST RUL_108 Source Model Error YR QT F-Type Model Error YR QT F-Type MHFCL LL5 Source WHFCL LL5 Source TF-Type NHFCL LL5 Source RUN_108 Source TF-Type NHFCL LL5 SSTCL RUN_109 Source Source Model	19 DF 65 641854 45 3 1 16 DF 114 641805 45 3 1 16 49 DF 133 640164 45 3 3 1 16 49 9 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330266.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 10596531 1966-2011 Ye 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 83274.810 1966-2011 Ye 459901.864 589190.659 30276.373 37977.138 786.759 39373.543 459501.864 589190.659 1966-2011 Ye 1966-2011 Ye 1960-2011 Ye	3847.334 Ar base Mean Square 5081.330 1.126 651.334 56363.219 100.831 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 2535.312 1699.486 2459.046 786.759 2460.846 1265.9.046 786.759 2460.846 1267.748 2606.005 ar base Mean Square 1807.458	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46	<0001	0.313624 CV = 63.71608	RUN_107 Source YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 95 95 416604 17 3 16 40 95 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 1321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye Type III SS 300284.228	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 tar base <u>Mean Square</u> 3382.555 0.618 811.525 4988.737 236.115 966.813 1866.205 tar base <u>Mean Square</u> 2364.443	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2	Pr > F       <0001	0.4938 CV = 36.305 R-Square 0.55513 CV = 34.0333
QT SST RUI_106 Source Model Error YR QT F-Type Model Error YR QT F-Type MHFCL LL5 Source Model Error YR QT F-Type MHFCL LL5 Source RUN_106 SSTCL RUN_109 Source Source Source	19 DF 65 641854 45 3 1 16 0F 114 641805 45 3 1 16 49 0F 133 640164 45 3 1 1 6 49 0F 0F 249 641670	73099.342 1966-2011 Ye 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 554.546 40564.994 83274.810 1966-2011 Ye Type III SS 459901.864 589190.659 30276.373 37977.138 786.759 39373.543 60159.638 49514.10012 1966-2011 Ye 1966-2011 Ye 1966-201 Ye 1966-201 Ye 1966-201 Ye 1966-201 Ye 1966-201 Ye 1	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.831 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 127 127 416709	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 300284.228 278813.271	Aar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 ar base Mean Square 3382.555 0.618 811.525 4988.737 236.115 966.813 1866.205 tar base Mean Square 2364.443 0.669	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 1568.990 3019.2 F Value 3533.85	Pr > F       <0001	R-Square 0.5551: CV = 34.033: R-Square 0.5185: CV =
QT SST RUN_106 Source Model Error YR QT F-Type NHFCL LL5 RUN_107 Source Model Error YR QT F-Type NHFCL LL5 RUN_108 Source NHFCL LL5 RUN_108 Source NHFCL LL5 RUN_108 Source NHFCL LL5 Source NHFCL LL5 Source NHFCL LL5 NHFCL LL5 Source Source Sour	19 DF 641854 45 3 1 16 114 641805 45 3 1 16 49 0 DF 133 640164 45 3 1 16 49 19 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 7ype III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 40564.994 1966-2011 Ye Type III SS 30276.373 37977.138 80519.0864 589190.859 30276.373 37977.138 459901.864 589190.859 30276.373 37977.138 459901.864 589190.859 30276.373 37977.138 459050.864 589190.859 30276.373 37977.138 459050.864 589190.859 30276.373 37977.138 459050.864 589190.859 30276.373 37977.138 459050.864 589190.859 30276.373 30276.374 30276.374 30276.374 30276.374 30276.374 30276.374 30276.374 30276.374 30276.374 30276.374 30276.374 30276.374 30276.375 30	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3474.216 255.312 1699.486 2535.312 1699.486 2535.312 1699.486 266.927 3566.590.46 786.759 2460.846 1227.748 2260.005 ar base Mean Square 187.7458 0.940 485.075	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 95 416604 17 3 127 416709	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 1966-2011 Ye 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye Type III SS 300284.228 278813.271	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 Hean Square 3382.555 0.618 811.525 4988.737 236.115 969.813 1866.205 969.813 1866.205 mar base <u>Mean Square</u> 236.4.443 0.669 625.333	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value 3533.85 934.61	Pr > F       <0001	0.4938       CV =       36.305       R-Square       0.55513       CV =       34.0333       Q.51853       CV =       0.51853       CV =
QT       SST       RUN_106       Source       Model       Error       YR       QT       F-Type       NHF       RUN_106       Source       Model       Error       YR       QT       F-Type       NHFCL       LL5       Source       Model       Error       YR       QT       F-Type       NHFCL       LL5       SSTCL       Source       Model       Error       YR       QT       F-Type       SSTCL       Source       Model       Error       YR       QT	19 DF 65 641854 45 3 1 16 0F 114 641805 45 3 1 16 49 0F 133 640164 45 3 1 1 6 49 0F 0F 249 641670	73099.342 1966-2011 Ye 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 554.546 40564.994 83274.810 1966-2011 Ye Type III SS 459901.864 589190.659 30276.373 37977.138 786.759 39373.543 60159.638 49514.10012 1966-2011 Ye 1966-2011 Ye 1966-201 Ye 1966-201 Ye 1966-201 Ye 1966-201 Ye 1966-201 Ye 1	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.81 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 169.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 127 127 416709	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 300284.228 278813.271	Aar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 ar base Mean Square 3382.555 0.618 811.525 4988.737 236.115 966.813 1866.205 tar base Mean Square 2364.443 0.669	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value 3533.85 934.61	Pr > F       <0001	0.4938       CV =       36.305       R-Square       0.55513       CV =       34.0333       Q.51853       CV =       0.51853       CV =
QT       SST       RUN_106       Source       Model       Error       YR       QT       F-Type       MHF       Source       Model       Error       YR       QT       F-Type       NHFCL       LL5       Source       Model       Error       YR       QT       F-Type       NHFCL       LL5       Source       Model       Error       YR       QT       STGL       Source       Model       Error       YR       QT       F-Type       Model       Error       YR       QT       F-Type       Model       Error       YR       QT       F-Type       NHFCL       WHFCL<	19 DF 641854 45 3 1 16 DF 114 641805 45 3 3 1 16 49 DF 133 640164 45 3 1 16 49 DF 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 7ype III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 43274.810 1966-2011 Ye Type III SS 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 459501.864 589190.659 30276.373 37977.138 60159.638 603072.940 21828.364 6094.740 783.326 45954.444	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 367.787.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 266.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403	3504.46 F Value 4512.00 4512.00 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.22 2673.74 1333.97 283.14 F Value 1923.14 516.12 21632.80 833.46 2307.18	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 <b>RUN_108</b> Source Model Error YR QT NHFCL LL5 SST <b>RUN_109</b> Source Model Error YR QT NHFCL	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 9 5 416604 17 3 16 17 3 16	1994–2011 Ye 7ype III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 7ype III SS 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994–2011 Ye 7ype III SS 300284.228 278813.271 10630.657 59754.226 5219.010	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 <u>Mean Square</u> 3382.555 0.618 811.525 4988.737 236.115 236.115 236.115 236.115 <u>Mean Square</u> 2364.443 0.669 625.333 19918.075 326.188	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value 3533.85 934.61 29769.20 487.51	$\begin{array}{c} Pr > F \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 000$	0.4938       CV =       36.305       R-Square       0.55513       CV =       34.0333       Q.51853       CV =       0.51853       CV =
QT     SST       RUN_106     Source       Model     Error       YR     QT       F-Type     NHF       RUN_107     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     SSUTCE       RUN 105     SSUTCE       Source     Model       Error     YR       QT     F-Type       NHFCL     LL5       SSUTCE     QT       F-Type     NHFCL       LL5     SUTCE	19 DF 641854 45 3 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 83274.810 1966-2011 Ye Type III SS 459901.864 4589190.659 30276.373 30276.374 450056.983 603072.940 21828.364 40994.444 7933.326	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 666.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403 1619.664	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 21632.80 833.46 207.18 1723.32	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5	DF 766 416760 17 3 16 40 95 416604 17 3 16 40 19 9 5 416709 127 416709 17 3 16 40 19	1994-2011 Ye Type III SS 2285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 1966-2011 Ye 1966-2011 Ye 13795.929 13795.929 38792.511 35457.89004 1994-2011 Ye 300284.228 278813.271 10630.657 59754.226 5219.010 54388.727	Aar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Mean Square 3382.555 0.618 811.525 4988.737 236.115 969.813 1866.205 rar base Mean Square 2364.443 0.669 625.333 19918.075 326.188 1356.718	F Value 5349.35 974.35 29238.80 462.90 1334.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21	$\begin{array}{c} Pr > F \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ \end{array}$	0.4938       CV =       36.305       R-Square       0.55513       CV =       34.0333       Q.51853       CV =       0.51853       CV =
QT     SST       RUN_106     Source       Model     Error       YR     QT       F-Type     NHF       RUN_107     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     SSTGL       Source     Model       Error     YR       QT     F-Type       NHFCL     LL5       Storce     Model       Error     YR       QT     F-Type       Model     Error       YR     QT       F-Type     Model       Error     YR       F-Type     NHFCL	19 DF 641854 45 3 1 16 DF 114 641805 45 3 3 1 16 49 DF 133 640164 45 3 1 16 49 DF 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 7ype III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 43274.810 1966-2011 Ye Type III SS 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 459501.864 589190.659 30276.373 37977.138 60159.638 603072.940 21828.364 6094.740 783.326 45954.444	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 367.787.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 266.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403	3504.46 F Value 4512.00 4512.00 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.22 2673.74 1333.97 283.14 F Value 1923.14 516.12 21632.80 833.46 2307.18	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 <b>RUN_108</b> Source Model Error YR QT NHFCL LL5 SST <b>RUN_109</b> Source Model Error YR QT NHFCL	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 9 5 416604 17 3 16 17 3 16	1994–2011 Ye 7ype III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 7ype III SS 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994–2011 Ye 7ype III SS 300284.228 278813.271 10630.657 59754.226 5219.010	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 <u>Mean Square</u> 3382.555 0.618 811.525 4988.737 236.115 236.115 236.115 236.115 <u>Mean Square</u> 2364.443 0.669 625.333 19918.075 326.188	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value 3533.85 934.61 29769.20 487.51	$\begin{array}{c} Pr > F \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ \end{array}$	0.4938       CV =       36.3059       R-Square       0.55513       CV =       34.0333       CV =       0.51853       CV =
QT SST RUN_106 Source Model Error YR QT F-Type NHFC LL5 Source Wodel Error YR QT F-Type NHFCL LL5 SSTCL RUN_109 Source NHFCL LL5 SSTCL RUN_109 Source NHFCL LL5 YR*QT	19 DF 641854 45 3 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 7ype III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 405901.864 589190.859 30276.373 37977.138 459901.864 589190.859 30276.373 37977.138 459101.864 589190.859 30276.373 37977.138 60159.638 603072.940 21828.364 60394.740 783.326 34695.694	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 36265.510 564.546 2535.312 1699.486 ar base Mean Square 366.927 35665.510 564.546 2253.312 1699.486 1227.748 2606.082 2460.846 1227.748 2606.082 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403 1619.664 270.338	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 21632.80 833.46 207.18 1723.32	<0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 <b>RUN_108</b> Source Model Error YR QT NHFCL LL5 SST <b>RUN_109</b> Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 127 416709 17 3 16 40 51	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye Type III SS 300284.228 278813.271 10630.657 59754.226 5219.010 54388.727 14326.092	ar base <u>Mean Square</u> 3762.607 0.703 685.338 20565.931 325.595 1360.904 tar base <u>Mean Square</u> 3382.555 0.618 811.525 4988.737 236.115 969.813 1866.205 tar base <u>Mean Square</u> 2364.443 0.669 625.333 19918.075 326.188 1359.718 280.904	F Value 5349.35 974.35 29238.80 462.90 1334.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21	$\begin{array}{c} Pr > F \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ \end{array}$	0.4938       CV =       36.3059       R-Square       0.55513       CV =       34.0333       CV =       0.51853       CV =
QT SST RUN_106 Source Model Error YR QT F-Type NHFC LL5 Source Wodel Error YR QT F-Type NHFCL LL5 SSTCL RUN_109 Source NHFCL LL5 SSTCL RUN_109 Source NHFCL LL5 YR QT F-Type NHFCL LL5 YR QT F-Type NHFCL LL5 YR QT F-Type NHFCL LL5 YR QT F-Type NHFCL LL5 SSTCL RUN_109 Source NHFCL LL5 YR QT F-Type NHFCL LL5 SSTCL S	19 DF 641854 45 3 1 16 DF 114 641805 45 3 1 16 49 0 DF 133 640164 49 19 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169039.656 108.581 55587.454 1966-2011 Ye 10564.2011 Ye 10564.2011 564.546 40564.994 43274.810 1966-2011 Ye 1966-2011 Ye	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.811 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403 1619.6405 1619.6405	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 2163.280 833.46 2307.18 1723.32 287.64 F Value F Value 516.12 2163.280 833.46 2307.18 1723.32 287.64	<0001 Pr > F <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5	DF 76 416760 17 3 16 40 95 416604 17 3 3 16 40 19 0 127 416709 17 3 16 40 51	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye 594.2201 Ye 1994-2011 Ye	Ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Hean Square 3382.555 0.618 811.525 4988.737 236.115 968.813 1866.205 Ar base Mean Square 2364.443 0.669 625.333 19918.075 326.188 159.718 280.904 Hean Square Mean Square	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83 F Value	Pr > F     F       <0001	0.4938 CV = 36.305 0.5513 34.0333 R-Square 0.51853 CV = 35.409
QT SST RUN_106 Source Model Error YR QT F-Type MHFC RUN_107 Source Model Error YR QT F-Type NHFCL LL5 WHFCL LL5 SSTCL RUN_109 Source Model Error YR QT F-Type NHFCL LL5 SSTCL RUN_109 Source Model Error XR QT F-Type NHFCL LL5 SSTCL RUN_109 Source Model Error SSTCL RUN_109 Source Model Error SSTCL RUN_109 Source Model Model Source MHFCL LL5 Source RUN_109 Source MHFCL LL5 Source MHFCL SSTCL	19 DF 641854 45 3 1 16 DF 114 641805 45 3 3 1 16 49 DF 133 640164 45 3 3 640164 45 3 1 1 6 49 DF 249 64167 45 3 1 1 16 49 19 249 64167 45 3 1 1 16 49 19 249 64167 19 249 64167 19 249 64167 19 249 64167 19 249 64167 19 249 64167 19 249 64167 19 249 64167 19 19 19 19 19 19 19 19 19 19	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 432274.810 1966-2011 Ye Type III SS 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 459501.864 589190.659 30276.373 37977.138 60159.638 603072.940 21828.364 60994.740 783.326 4595.944 1966-2011 Ye Type III SS 45056.983 603072.940 21828.364 60994.740 783.326 4595.944 1966-2011 Ye Type III SS 4595.944 1966-2011 Ye 1966-2011 Ye 1966-2011 Ye 1966-2011 Ye 1966-2011 Ye 1966-2014 Ye 1967-2014 Ye 1966-2014 Ye 1967-2014 Ye 1967-2014 Ye 1967-2014 Ye 1967-2014 Ye 1967-2014 Ye 1967-2014 Ye 1967-2014 Ye 1967-2014 Ye 1967-2014 Ye	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 3566.5510 3566.5510 3566.5510 3566.5510 3566.5510 3666.927 80.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403 1619.664 270.338 ar base Mean Square 1833.188	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 21632.80 833.46 2307.18 1723.32 287.64	<0001 Pr > F (0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <	0.313624 CV = 63.71608	RUN 107 Source Model Error YR QT NHFCL LL5 RUN 108 Source Model Error YR QT NHFCL LL5 SST RUN 109 Source Model Tror YR QT NHFCL LL5 ST RUN 110 Source Model	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 9 127 416709 17 3 16 40 51	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 354336.142 1966-2011 Ye Type III SS 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye Type III SS 300284.228 278813.271 10630.657 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye Type III SS 334105.728	Mean     Square       3762.607     0.703       685.338     20565.931       325.595     3360.904       ar base     Mean       Mean     Square       3382.555     0.618       811.525     4988.737       236.115     969.813       1866.205	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83	Pr > F     F       <0001	0.4938       CV =       36.305       R-Square       0.55513       CV =       34.0333       CV =       35.409       R-Square       R-Square       8.35.409
QT     SST       SST     Source       Model     Error       YR     QT       F-Type     Model       Error     Model       FOR     Model       Error     RUN 108       Source     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     SSTCL       QU     GT       F-Type     NHFCL       LL5     YR       YR     QT       F-Type     NHFCL       LL5     YR       YR     QT       F-Type     NHFCL       LL5     YR <tr td="" td<=""><td>19 DF 641854 45 3 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0</td><td>73099.342 1966-2011 Ye 7ype III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 7ype III SS 413561.289 639568.634 30911.729 106996.531 554.546 40564.994 83274.810 1966-2011 Ye 7ype III SS 459901.864 589100.659 30276.373 37977.138 786.759 30373.543 60159.638 49514.10012 1966-2011 Ye 1966-2011 Ye 1966-2011 Ye 450056.983 603072.940 21828.364 45995.694 1966-2011 Ye 793.326 34694.444 36495.694</td><td>3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.811 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403 1619.6405 1619.6405</td><td>3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 2163.280 833.46 2307.18 1723.32 287.64 F Value F Value 516.12 2163.280 833.46 2307.18 1723.32 287.64</td><td>&lt;0001 Pr &gt; F &lt;0001</td><td>0.313624 CV = 63.71608</td><td>RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5 SYR QT NHFCL LL5 YR QT NHFCL LL5 YR QT</td><td>DF 76 416760 17 3 16 40 55 416604 17 3 16 40 19 0 17 3 16 416709 17 3 16 400 51</td><td>1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye 594.2201 Ye 1994-2011 Ye</td><td>Ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Hean Square 3382.555 0.618 811.525 4988.737 236.115 968.813 1866.205 Ar base Mean Square 2364.443 0.669 625.333 19918.075 326.188 159.718 280.904 Hean Square Mean Square</td><td>F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83</td><td>Pr &gt; F     F       &lt;0001</td>     &lt;0001</tr>	19 DF 641854 45 3 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye 7ype III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 7ype III SS 413561.289 639568.634 30911.729 106996.531 554.546 40564.994 83274.810 1966-2011 Ye 7ype III SS 459901.864 589100.659 30276.373 37977.138 786.759 30373.543 60159.638 49514.10012 1966-2011 Ye 1966-2011 Ye 1966-2011 Ye 450056.983 603072.940 21828.364 45995.694 1966-2011 Ye 793.326 34694.444 36495.694	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.811 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403 1619.6405 1619.6405	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 2163.280 833.46 2307.18 1723.32 287.64 F Value F Value 516.12 2163.280 833.46 2307.18 1723.32 287.64	<0001 Pr > F <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5 SYR QT NHFCL LL5 YR QT NHFCL LL5 YR QT	DF 76 416760 17 3 16 40 55 416604 17 3 16 40 19 0 17 3 16 416709 17 3 16 400 51	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye 594.2201 Ye 1994-2011 Ye	Ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Hean Square 3382.555 0.618 811.525 4988.737 236.115 968.813 1866.205 Ar base Mean Square 2364.443 0.669 625.333 19918.075 326.188 159.718 280.904 Hean Square Mean Square	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83	Pr > F     F       <0001	0.4938 CV = 36.305 0.55513 CV = 34.0333 CV = 34.0333 CV = 35.409
19 DF 641854 45 3 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye 7ype III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye 7ype III SS 413561.289 639568.634 30911.729 106996.531 554.546 40564.994 83274.810 1966-2011 Ye 7ype III SS 459901.864 589100.659 30276.373 37977.138 786.759 30373.543 60159.638 49514.10012 1966-2011 Ye 1966-2011 Ye 1966-2011 Ye 450056.983 603072.940 21828.364 45995.694 1966-2011 Ye 793.326 34694.444 36495.694	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.811 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 783.326 2168.403 1619.6405 1619.6405	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 2163.280 833.46 2307.18 1723.32 287.64 F Value F Value 516.12 2163.280 833.46 2307.18 1723.32 287.64	<0001 Pr > F <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001 <0001	0.313624 CV = 63.71608	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5 SYR QT NHFCL LL5 YR QT NHFCL LL5 YR QT	DF 76 416760 17 3 16 40 55 416604 17 3 16 40 19 0 17 3 16 416709 17 3 16 400 51	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye 594.2201 Ye 1994-2011 Ye	Ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Hean Square 3382.555 0.618 811.525 4988.737 236.115 968.813 1866.205 Ar base Mean Square 2364.443 0.669 625.333 19918.075 326.188 159.718 280.904 Hean Square Mean Square	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83	Pr > F     F       <0001		
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    CV =       34.0333       R-Square       0.51855       CV =       35.409       R-Square       0.57718       CV =       0.57718       CV =
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0.468304       CV =	RUN_107 Source VR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5 SYR*QT RUN_110 Source Model Error	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 9 9 5 127 416709 17 3 16 40 9 9 5 127 416709 17 3 16 40 9 5 127 416753	1994-2011 Ye Type III SS 225958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye 534105.728 334105.728 244745.418	Ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 Ar base Mean Square 3382.555 0.618 811.525 4988.737 236.115 969.813 1866.205 Ar base Mean Square 2364.443 0.669 625.333 19918.075 326.188 1359.718 2280.904 Xer base Mean Square 2288.395 0.588 759.941	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1368.990 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83 934.810	Pr ≥ F       <0001	0.4938       CV =       36.305!       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QT     SST       RUN_106     Source       Model     Error       YR     QT       F-Type     Model       Bource     Model       Model     Error       YR     QT       F-Type     Model       Error     YR       QT     F-Type       NHFCL     LL5       Source     Model       Model     Error       YR     QT       F-Type     NHFCL       LL5     SSTCL       RUN 109     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     SNFCL       SUNTCE     Model       Error     YR       QT     F-Type       MHFCL     LL5       YR*QT     F       YR     QT       Frort     Model       Error     Model       Error     YR       QT     GU	19 DF 641854 45 3 1 16 DF 114 641805 45 3 1 16 49 DF 133 640164 45 3 3 640164 45 3 3 640164 45 3 3 1 1 6 49 0 DF 249 641670 45 3 1 1 6 49 19 6 41805 5 6 6 6 6 6 6 6 6 6 6 6 6 6	73099342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 106996.531 564.546 40564.994 40594.185 30276.373 37977.138 459910.864 589190.659 30276.373 37977.138 459910.864 589190.659 30276.373 37977.138 459501.864 589190.659 30276.373 37977.138 459501.864 589190.659 30276.373 37977.138 459504.864 459504.864 459504.864 459504.864 459504.864 459505.944 60394.740 7483.254 36035.2940 21828.364 60394.740 7383.254 36035.343 3695.694 36036.9211 Ye Type III SS 49129.467 557788.056 22083.214 22083.214 22083.214	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 3564.546 2535.312 1699.486 ar base Mean Square 367.738 2460.846 1227.748 2650.046 1227.748 2660.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 0.940 485.075 20331.580 0.940 485.075 20331.580 1619.664 270.338 ar base Mean Square 183.218 0.872 490.738 7543.300 102.035	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 254.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 21632.80 83.46 2307.18 1723.32 287.64 F Value 516.52 2103.44 516.52 2103.44 563.08 8655.34 1149.76	$\begin{array}{c} < 0001 \\ \hline Pr > F \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 00001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 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QT     SST       RUN_106     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     Source       Model     Error       YR     QT       F-Type     NHFCL       LL5     Source       Source     Model       Error     YR       QT     F-Type       NHFCL     LL5       Source     Model       Error     YR       QT     F-Type       NHFCL     LL5       SSTCL     RUN 109       Source     Model       Error     YR       QT     F-Type       NHFCL     LL5       Source     Model       Error     YR       QT     F-Type       NHFCL     LL5       Source     Model       Error     YR       QT     F-Type       NHFCL     LL5  Source     Model  Er	19 DF 641854 45 3 1 16 114 641805 45 3 1 16 49 0 DF 133 640164 45 3 1 16 49 19 0 DF 249 641670 45 3 1 16 49 19 0 DF 249 641670 45 3 1 16 49 19 0 DF 249 641670 45 3 1 16 49 19 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye Type III SS 330286.480 722843.444 29310.040 169089.656 108.581 55587.454 1966-2011 Ye Type III SS 413561.289 639568.634 30911.729 639568.634 30911.729 106996.531 564.546 40564.994 83274.810 1966-2011 Ye Type III SS 30276.373 37977.138 786.759 39373.543 60159.638 459910.864 589190.659 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 60159.638 459910.864 589190.659 30276.373 37977.138 459901.864 589190.659 30276.373 37977.138 459956.983 603072.940 21828.364 60994.740 783.326 34695.694 1966-2011 Ye Type III SS 46126.694 46095.694 1966-2011 Ye 7798.056 2083.214 42629.899 1002.035 3437.571 61434.264	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 666.927 36565.510 564.546 2535.312 1699.466 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 1227.748 2606.005 ar base Mean Square 1807.458 0.940 485.075 20331.580 0.940 485.075 20331.580 0.940 485.075 20331.580 0.940 345.326 2168.403 1619.664 210.338 ar base Mean Square 1807.458 0.940 485.075 20331.580 0.940 345.326 2168.403 1619.664 270.338 ar base Mean Square 1833.188 0.872 490.738 354.300 1002.035 2146.098 1253.761	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 37570.70 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 21632.80 833.46 2307.18 1723.32 287.64 F Value 1923.14 516.12 21632.80 833.46 2307.18 1723.32 287.64 F Value 1923.14 516.12 21632.80 833.46 2307.18 1723.32 287.64 F Value 1923.14 516.12 21632.80 833.46 2307.18 1723.32 287.64 F Value 1923.14 516.12 287.64 1923.14 516.12 287.64 1923.14 1924.14 1924.14 1924.14 1924.14 1924.14 1924.14 1924.14	$\begin{array}{c} < 0001 \\ \hline Pr > F \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ 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0.438381       CV =       57.48082         R-Square=       0.427352       CV =       58.20685         R-Square=       0.468304       CV =	RUN_107 Source VR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5 YR*QT RUN_110 Source Model Error YR QT NHFCL LL5 YR*QT	DF 76 416760 17 3 16 40 95 416604 17 3 16 40 19 17 3 16 40 19 17 3 16 40 0 51 17 3 16 416553 17 3 16 416553 17 3 16 40 6 416709	1994-2011 Ye Type III SS 285958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye 777.839 38792.511 35457.89004 1994-2011 Ye 10630.657 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye 5334105.728 244745.418 12919.005 16060.035 16060.035 13832.467	Ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 1360.904 ar base Mean Square 3382.555 0.618 811.525 4988.737 236.115 968.813 1866.205 ar base Mean Square 2364.443 0.669 625.333 19918.075 326.188 1359.718 280.904 ar base Mean Square 2228.395 0.588 759.941 535.3345 535.345 233.996 970.812	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 3019.2 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83 F Value 3894.810 1293.410 9111.310 1293.410 9111.310	Pr > F     F       <0001	0.4938       CV =       36.3054       R-Square       0.55513       34.0333       CV =       34.0333       CV =       35.4094       R-Square       0.57718       CV =
QT <u>SST</u> <u>Source</u> Model Error YR QT F-Type NHF <u>RUN 107</u> <u>Source</u> Model Error YR QT F-Type NHFCL LL5 <u>SSTCL</u> <u>Source</u> Model Error YR QT F-Type NHFCL LL5 <u>SSTCL</u> <u>Source</u> Model Error YR QT F-Type NHFCL LL5 <u>SSTCL</u> <u>Source</u> Model Error YR QT F-Type NHFCL LL5 <u>SSTCL</u> <u>Source</u> Model Error YR QT F-Type NHFCL LL5 <u>Source</u> Model Error YR QT F-Type NHFCL <u>Source</u> Model Error YR QT F-Type NHFCL <u>Source</u> Model Error YR QT F-Type NHFCL <u>Source</u> Model Error YR QT F-Type NHFCL <u>Source</u> Model Error YR QT F-Type NHFCL <u>Source</u> <u>Source</u> <u>Source</u> <u>NHFCL</u> <u>Source</u> <u>NHFCL</u> <u>Source</u> <u>Source</u> <u>NHFCL</u> <u>Source</u> <u>NHFCL</u>	19 DF 641854 45 3 1 16 114 641805 45 3 1 16 49 DF 133 640164 49 0 DF 249 641670 45 3 1 16 49 9 13 640164 45 3 1 1 16 49 0 DF 249 641670 45 3 1 1 16 49 13 640164 45 3 1 1 16 49 13 640164 45 3 1 1 16 49 0 13 640164 45 3 1 1 16 49 0 13 640164 45 3 1 1 16 49 9 13 640164 45 3 1 1 16 49 9 19 0 0 0 0 0 0 0 0 0 0 0 0 0	73099.342 1966-2011 Ye 1966-2011 Ye 29310.040 169039.656 108.581 55587.454 1966-2011 Ye 10564.581 10564.289 639568.634 30911.729 106906.531 564.546 40564.994 43274.810 1966-2011 Ye 1966-2011 Ye 1965-2011 Ye 1965-2011 Ye 1965-2011 Ye 1965-2011 Ye 1966-2011 Ye 1965-2011 Ye 1965-201 Ye 1965-201 Ye 19	3847.334 ar base Mean Square 5081.330 1.126 651.334 56363.219 108.581 3474.216 ar base Mean Square 3627.731 0.997 686.927 35665.510 564.546 2535.312 1699.486 ar base Mean Square 3457.909 0.920 672.808 12659.046 786.759 2460.846 12659.046 786.759 2460.846 12659.046 786.759 2460.846 12659.046 786.759 2460.846 12659.046 786.759 2460.846 12659.046 786.757 20331.580 783.326 2168.403 1619.664 270.338 ar base Mean Square 1837.180 783.326 2168.403 1619.664 270.338 ar base 183.188 0.872 490.738 7543.300 102.035 2146.098	3504.46 F Value 4512.00 578.36 50048.10 96.41 3084.95 F Value 3640.42 689.33 35790.20 566.52 2544.18 1705.43 F Value 3757.07 731.02 13754.20 854.82 2673.74 1333.97 2831.46 F Value 1923.14 516.12 21632.80 833.46 2307.18 F Value 1923.14 516.52 287.64 F Value 563.08 8655.34 1149.76 2462.48 563.08	<0001 Pr > F (0001) (0001 (0001 (0001) (0001 (0001) (0001 (0001) (0001 (0001) (00	0.313624       CV =       63.71608       R-Square=       0.392697       CV =       59.93591         R-Square=       0.438381       CV =       57.48082         R-Square=       0.427352       CV =       58.20685         R-Square=       0.468304       CV =	RUN_107 Source Model Error YR QT NHFCL LL5 RUN_108 Source Model Error YR QT NHFCL LL5 SST RUN_109 Source Model Error YR QT NHFCL LL5 YR*QT RUN_110 Source Model Error YR QT NHFCL	DF 76 416760 17 3 16 40 95 416604 17 3 3 16 40 19 0 0 127 416709 127 416709 17 3 16 40 51 0 51 17 3 16 416553 17 3 16	1994-2011 Ye Type III SS 225958.136 293139.363 11650.753 61697.794 5209.523 54436.142 1966-2011 Ye Type III SS 321342.748 257508.398 13795.929 14966.212 3777.839 38792.511 35457.89004 1994-2011 Ye Type III SS 300284.228 278813.271 10630.657 59754.226 5219.010 54388.727 14326.092 1994-2011 Ye Type III SS 334105.728 244745.418 12919.005 16060.035 3743.941	Ar base Mean Square 3762.607 0.703 685.338 20565.931 325.595 0.618 811.525 0.618 811.525 4988.737 236.115 969.813 1866.205 ar base Mean Square 2364.443 0.669 625.333 19918.075 3261.88 1359.718 230.944 5353.345 0.588 759.941 5353.345 233.996 970.812 1784.165	F Value 5349.35 974.35 29238.80 462.90 1934.81 F Value 5472.390 1312.910 8070.910 381.990 1568.990 30192 F Value 3533.85 934.61 29769.20 487.51 2032.21 419.83 F Value 3894.810 9111.310 398.260	$\begin{array}{c} Pr \ge F \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ < 0001 \\ 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CV =       35.409       R-Square       0.57718       CV =       0.57718       CV =

Table 4.	Results of	ANOVA	from	Negative	Binomial	model	tested	for	distant	water	and
offsh	ore longline	and sma	ll long	gline fishe	ries.						

Negative B	inomial I	Model 110			
Distant wate	wr and offs	shore longline	Small longline		
	d.f. (	Chi−square Pr > ChiSq		d.f.	Chi-square Pr > ChiSq
YR	45	31682.8 <.0001	YR	17	24280.1 <.0001
QT	3	26898.1 <.0001	QT	3	26942.3 <.0001
F-Type	1	183.42 <.0001			
NHFCL	16	33667.6 <.0001	NHFCL	16	3372.51 <.0001
LL5	49	48713.5 <.0001	LL5	40	57832.7 <.0001
SST	19	42583.5 <.0001	SST	19	48717.2 <.0001
<u>YR*QT</u>	135	38525.4 <.0001	YR*QT	51	25451.3 <.0001

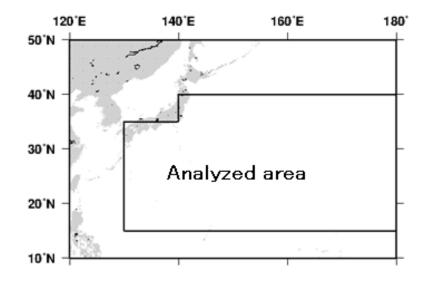


Fig. 1. Analysis area used in this study.

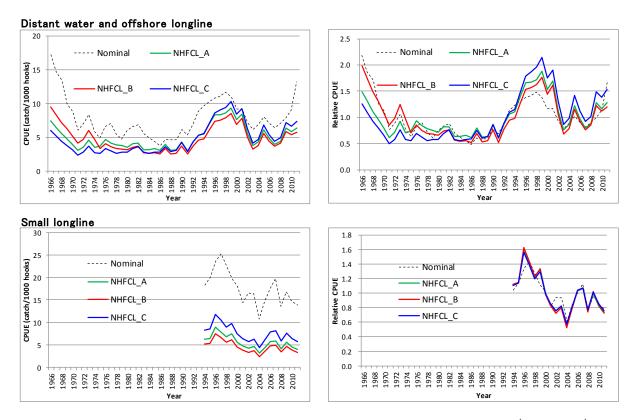
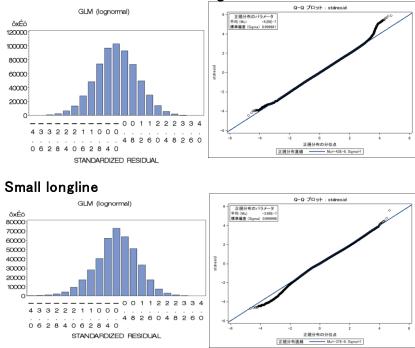
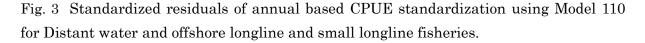


Fig. 2. Annual based CPUE in number standardized using L5, L1 and fine (set by set) data sets from 1960 to 2009 for main fishing ground (top) and whole (bottom) Indian Ocean expressed in relative (left figure) and real (right figure) scale overlaid with nominal CPUE.



Distant water and offshore longline



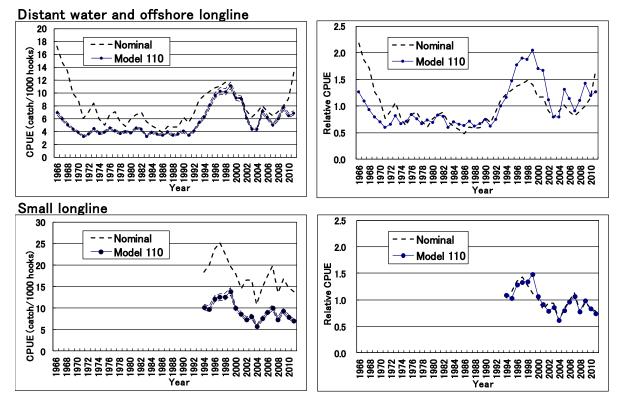


Fig. 4. Standardized CPUE in real (left) and relative scale by applying Model 110 for distant water and offshore longline and small longline fisheries overlaying with nominal CPUE..

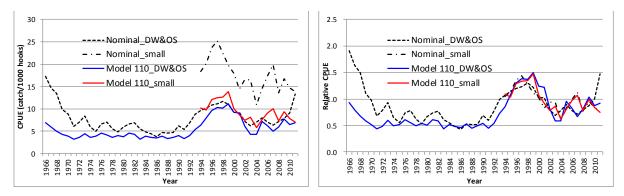


Fig. 5. Comparison of standardized CPUEs between distant water and offshore longline and small longline fisheries in real scale (left) and relative scale (right), overlaying with nominal CPUE of both fishery groups.

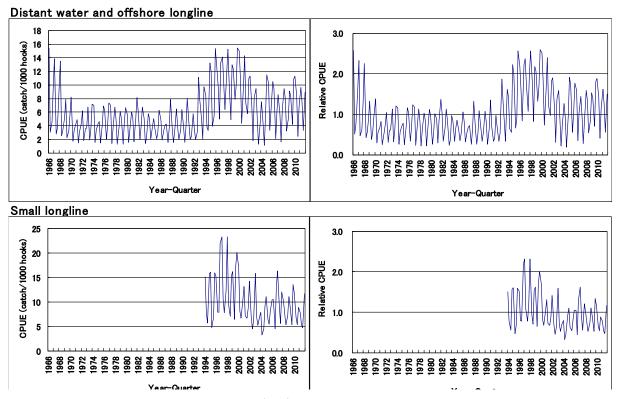
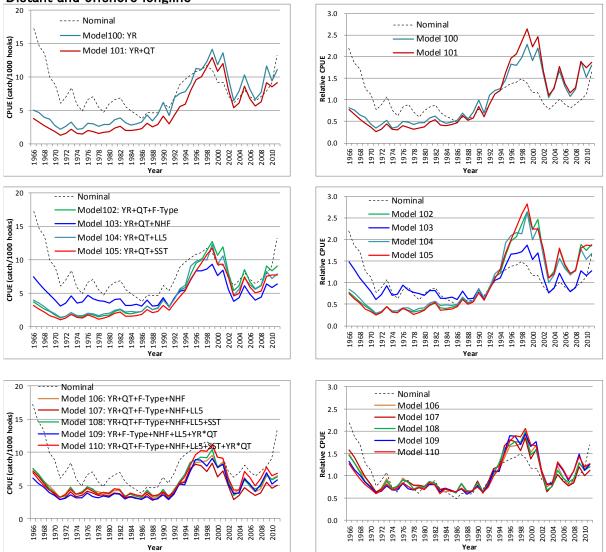


Fig. 6. Standardized CPUE in real (left) and relative scale by applying Model 110 for distant water and offshore longline and small longline fisheries overlaying with nominal CPUE..



#### Distant and offshore longline

Fig. 7. Observation of the effect of each explanatory variable on the standardized CPUE trend, for distant and offshore longline and small longline fisheries by overlaying CPUEs derived from each model.

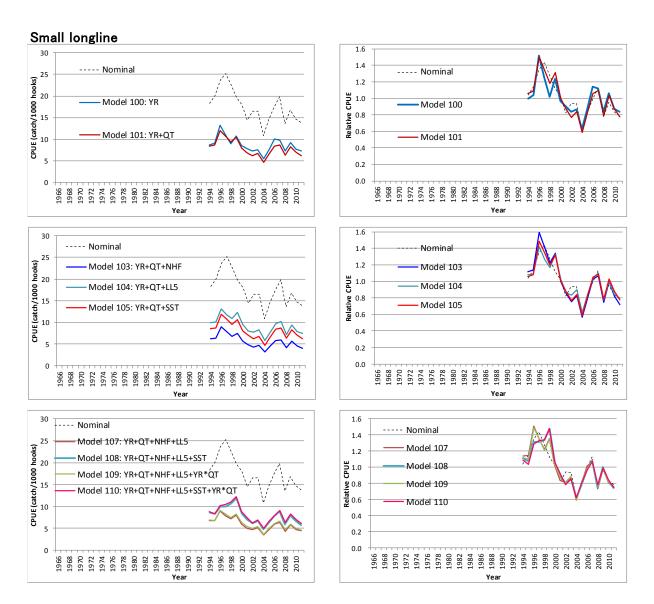


Fig. 7. Continued.

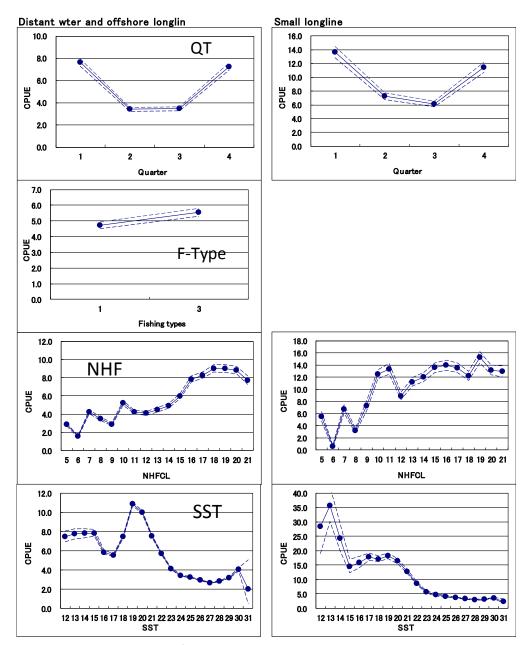


Fig. 8. Effect of main variables (QT: quarter, F-Type: distant water longline or offshore longline, NHF: Number of hooks between float, SST: sea surface temperature) applied in Model 110 for distant and offshore longline and small longline fisheries.

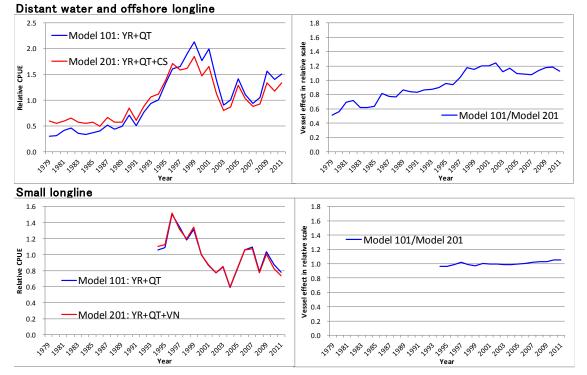


Fig. 9. Standardized CPUEs applying models without (Model 101: YR+QT) and with vessel identification (Model 201: YR+QT +call sign or + vessel name) (left). Right figures ware historical trend of fishing power (right) estimated as the ratio of these index.(Model101/Model201).

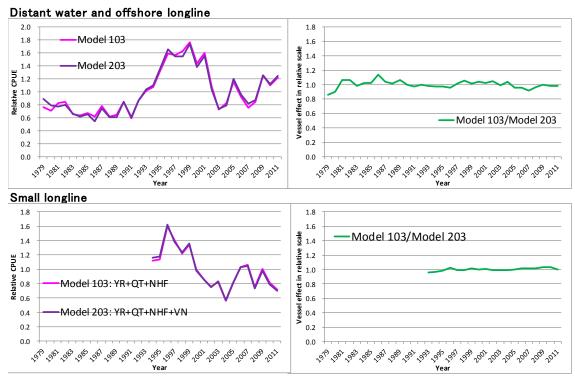


Fig. 10. Standardized CPUEs applying models without (Model 103: YR+QT+NHF) and with vessel identification (Model 203: YR+QT+NHF +call sign or + vessel name) (left). Right figures ware historical trend of fishing power (right) estimated as the ratio of these index.(Model103/Model203).

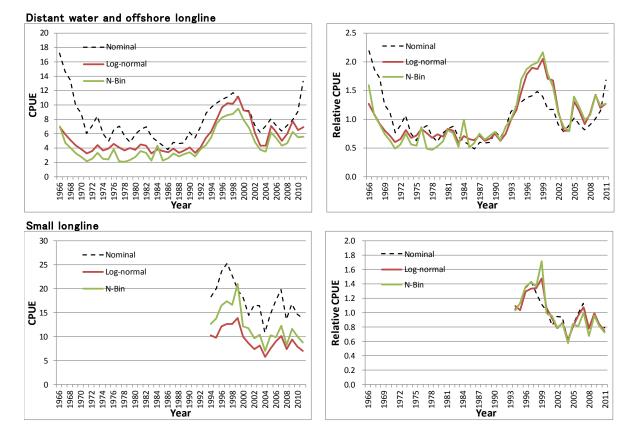
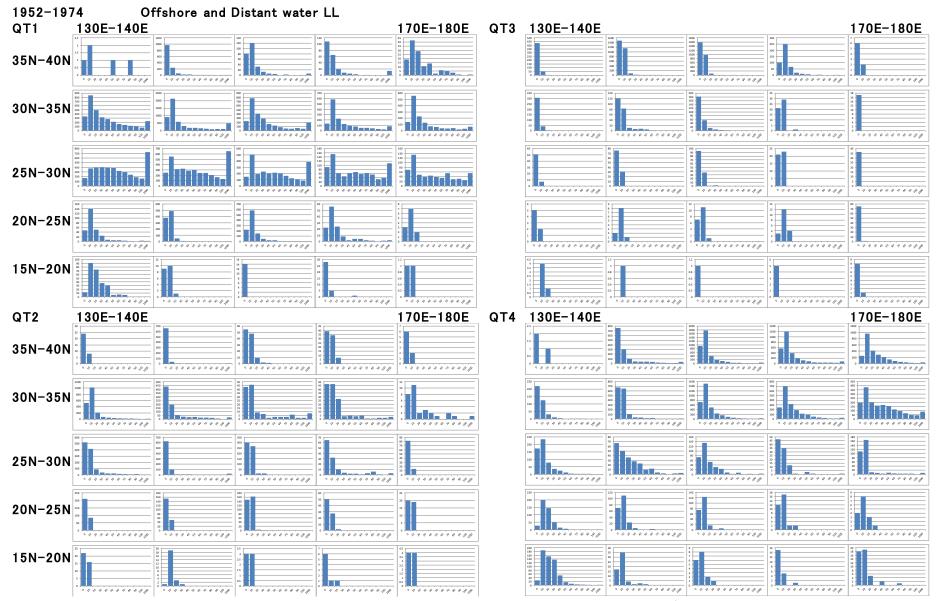
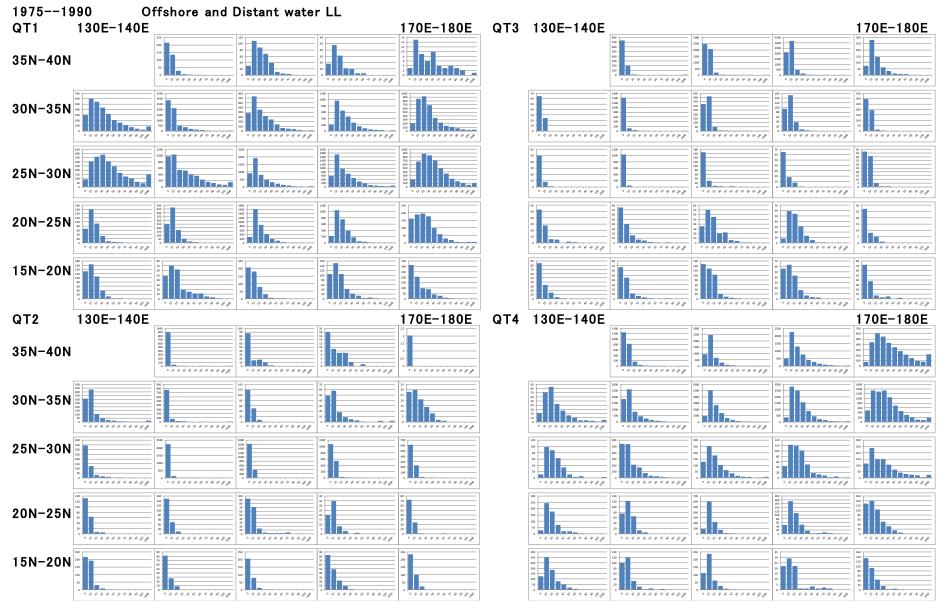


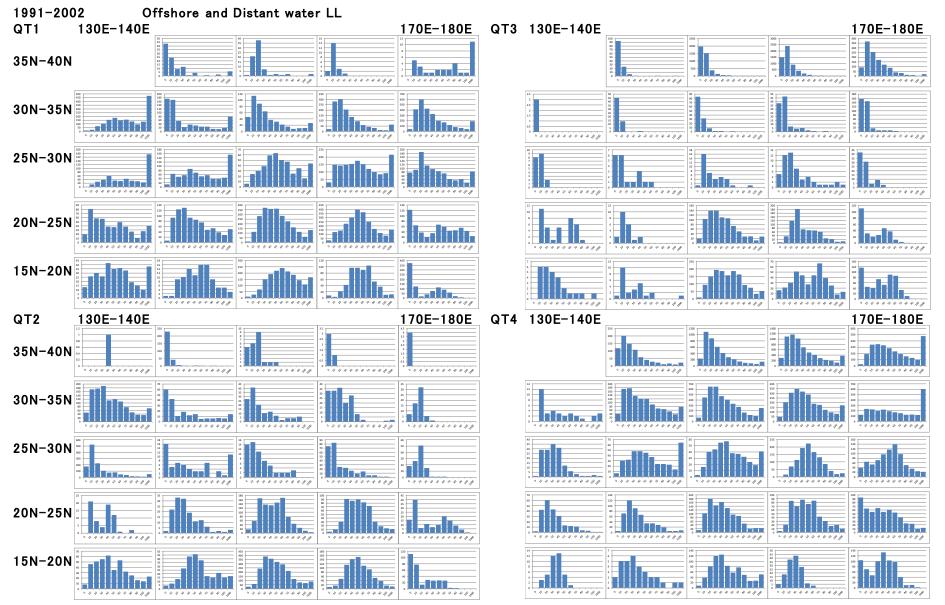
Fig. 11. Comparison of standardized CPUE by Log-normal model and Negative-binomial model, in which the same set of explanatory variables as Model 110 were included.



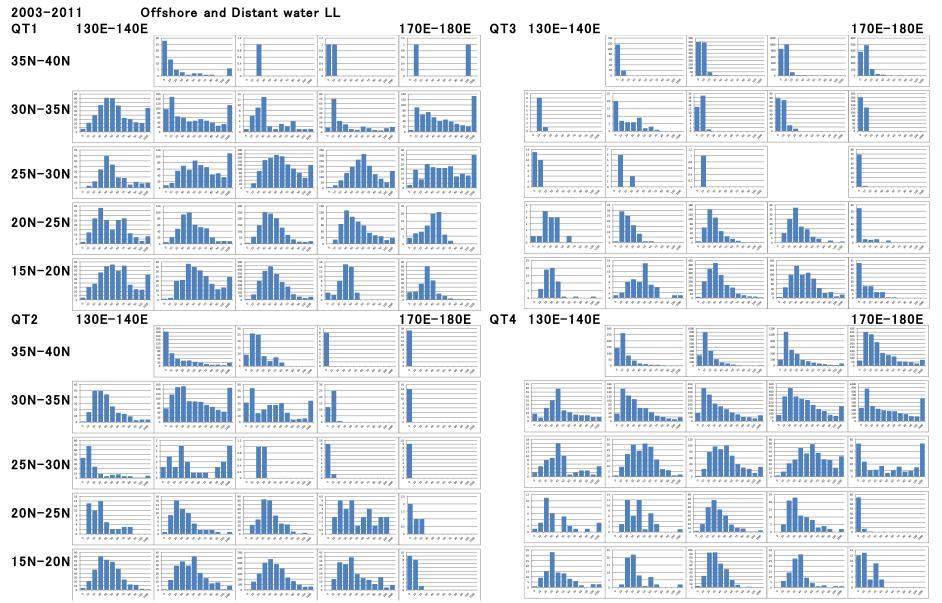
Appendix Fig. 1. Histograms of the number of longline set by catch in number per set, by fishery type (distant water and offshore longline and small longline), period of years (1952-1974, 1975-1990, 1991-2002 and 2003-2011) and quarter in 5° latitude by 10° longitude 10 resolution.



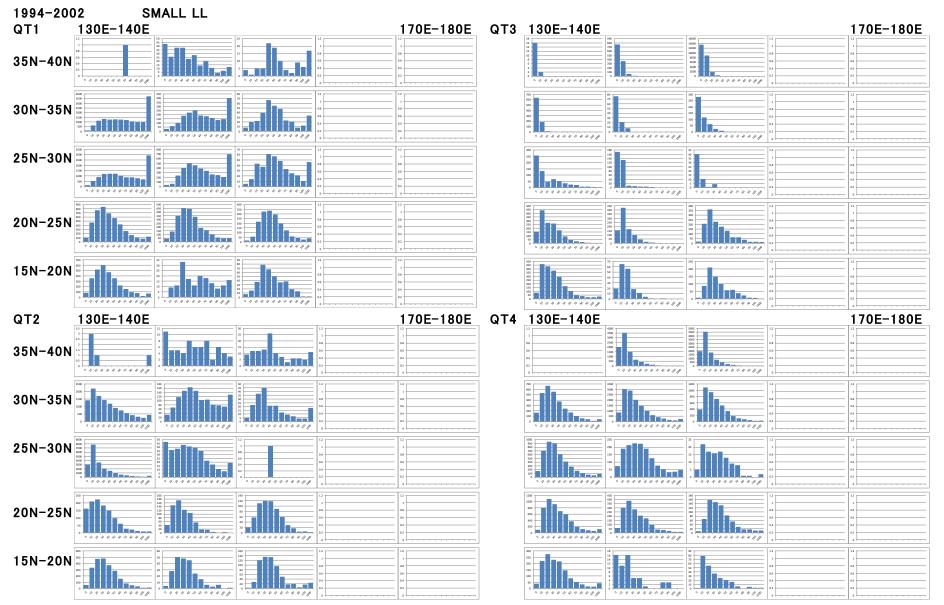
Appendix Fig. 1. Continued.



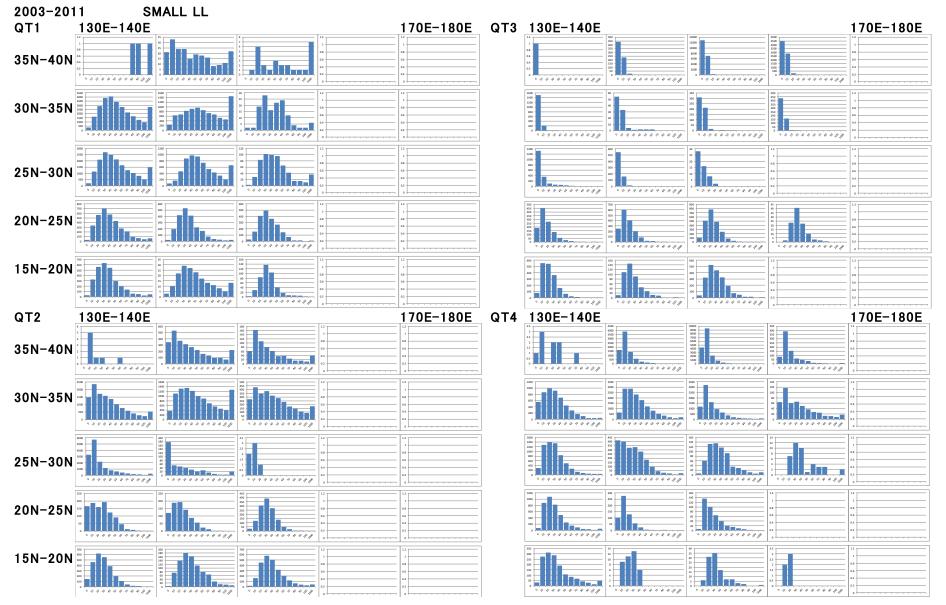
Appendix Fig. 1. Continued.



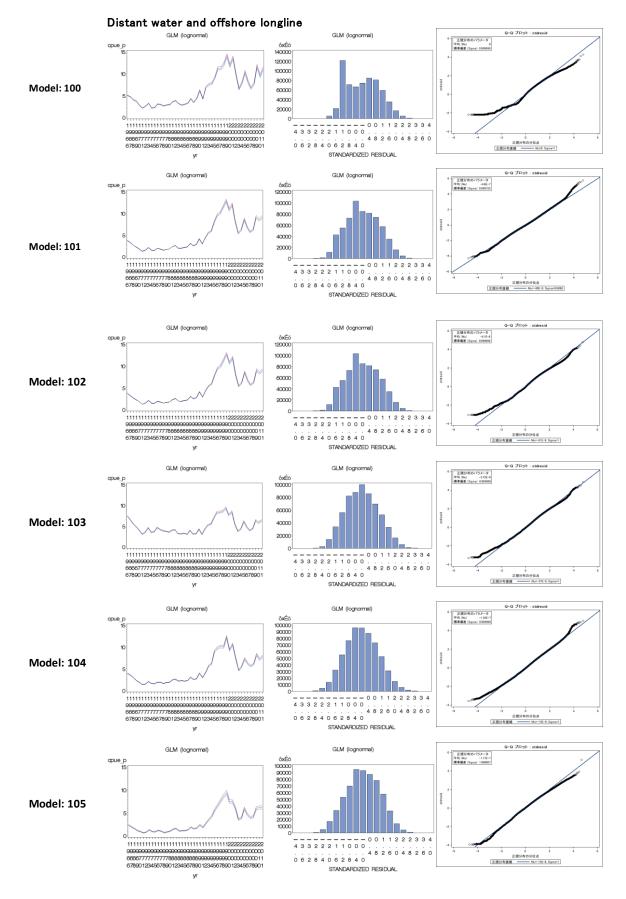
Appendix Fig. 1. Continued.



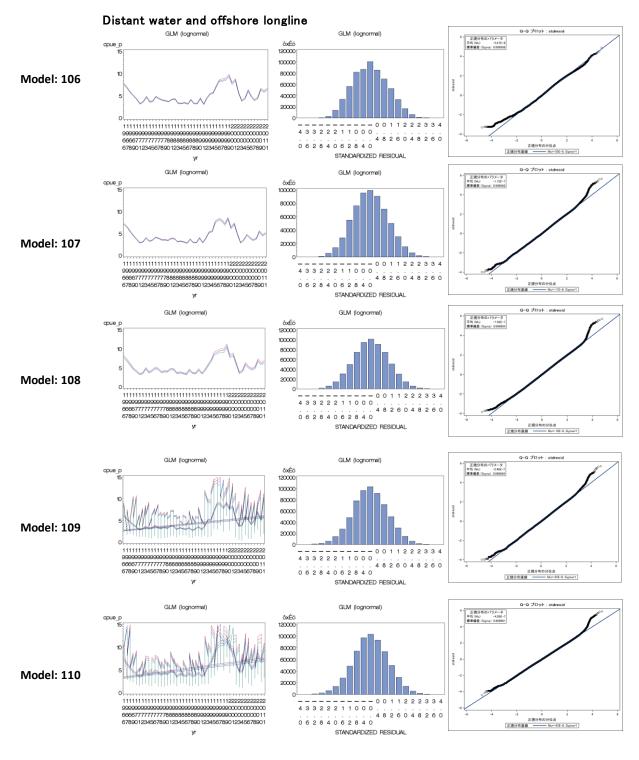
Appendix Fig. 1. Continued.



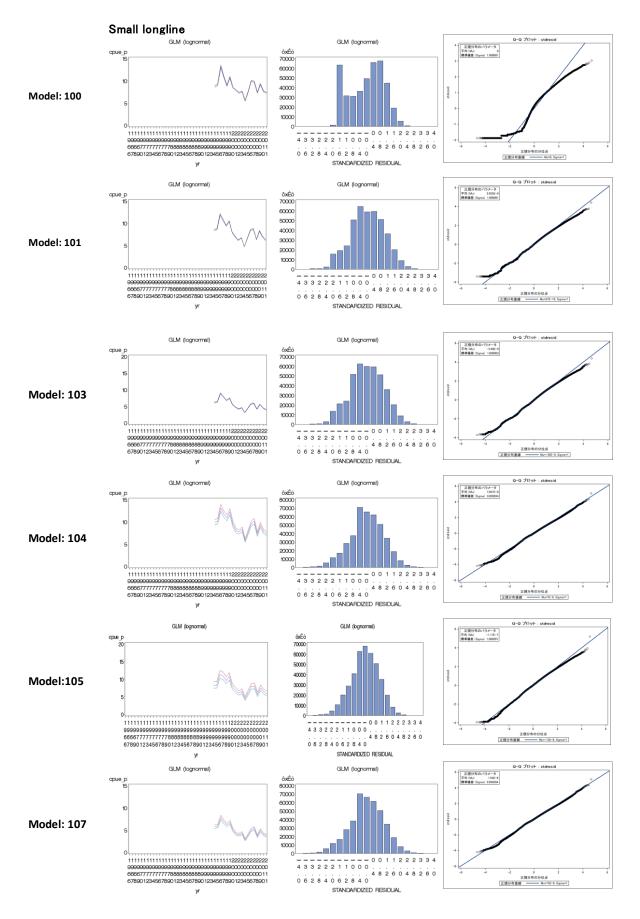
Appendix Fig. 1. Continued.



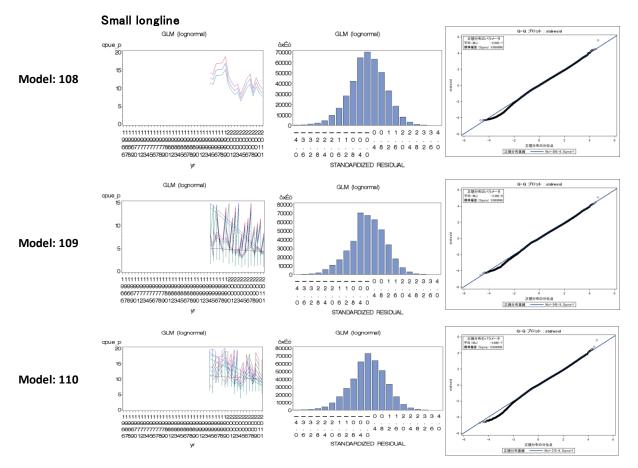
Appendix Fig. 2. Standardized CPUE and standardized residuals derived from all models applied for distant water and offshore longline and small longline fisheries.



Appendix Fig. 2. Continued.



Appendix Fig. 2. Continued.



Appendix Fig. 2. Continued.