

# Package ‘sautilities’

September 30, 2024

**Title** Seasonal Adjustment Utilities For Use With the Seasonal Package

**Version** 5.0

**Description** Several utilities to provide support for the seasonal package. This includes routines that select the X-11 seasonal filter based on the magnitude of the estimate of the seasonal moving average coefficient from the airline model, duplicates the functionality of the TERROR software that performs quality control on time series based on one step ahead forecasts, generate model summaries from seas objects, generate names and abbreviations for X-13ARIMA-SEATS tables, save spec files, seasonal objects, and metafiles into external files, process list objects of numbers, indicate which elements of a list have try-errors, replace NA with a string, set outlier critical values, add an outlier spec to a static seas element, get indexes and entries from UDG output generated from seasonal, save seasonal objects into R scripts and X-13ARIMA-SEATS spec files, and functions to collect diagnostics summaries for various X-13ARIMA-SEATS diagnostics.

**License** MIT + file LICENSE

**Encoding** UTF-8

**LazyData** true

**Roxygen** list(markdown = TRUE)

**RoxygenNote** 7.3.2

**Depends** R (>= 2.10)

**Imports** seasonal,  
stringr

## Contents

absmax	4
absolute_pct_diff	4
acf_fail	5
acf_fail_why	6
acf_test	7
acf_warn	8
acf_warn_why	9
all_model_diag	10
all_model_diag_list	12
check_stats	14
choose_optimal_seasonal_filter	16
combined_spectrum_test	17

compare_dates . . . . .	18
convert_date_string_to_date . . . . .	18
d11f_test . . . . .	19
d11f_test_why . . . . .	20
employment_data_mts . . . . .	21
employment_list . . . . .	21
fix_diag_list . . . . .	22
gen_ao_outlier_ts . . . . .	23
gen_ar_spec_cv . . . . .	24
gen_hybrid_sa . . . . .	24
gen_ls_outlier_ts . . . . .	25
gen_tc_outlier_ts . . . . .	26
gen_x13_table_list . . . . .	27
get_acf . . . . .	28
get_arima_estimates_matrix . . . . .	29
get_auto_outlier_string . . . . .	30
get_fcst_tval . . . . .	30
get_ftest_from_udg . . . . .	31
get_model_ftest . . . . .	32
get_month_index . . . . .	33
get_mq_key . . . . .	33
get_mq_label . . . . .	34
get_nonseasonal_theta . . . . .	35
get_norm_stat . . . . .	36
get_outlier_list . . . . .	36
get_regarima_estimates_matrix . . . . .	37
get_regression_estimates_matrix . . . . .	38
get_reg_string . . . . .	39
get_seasonal_ftest_all . . . . .	40
get_seasonal_ftest_prob . . . . .	41
get_seasonal_theta . . . . .	42
get_timer . . . . .	43
get_transform . . . . .	43
get_udg_entry . . . . .	44
get_udg_index . . . . .	45
get_value_from_udg . . . . .	45
get_window . . . . .	46
input_saved_x13_file . . . . .	47
lbq_fail . . . . .	48
lbq_fail_why . . . . .	49
lbq_test . . . . .	50
make_diag_df . . . . .	51
match_list . . . . .	53
match_list_number . . . . .	54
member_of_list . . . . .	55
model_summary_list . . . . .	56
model_test . . . . .	57
model_test_why . . . . .	58
mq_test . . . . .	59
norm_test . . . . .	60
norm_test_why . . . . .	61
NP_test . . . . .	62

optimal_seasonal_filter . . . . .	62
overall_seasonal_test_1 . . . . .	64
overall_seasonal_test_2 . . . . .	65
process_list . . . . .	66
proc_outlier . . . . .	67
qs_fail_why . . . . .	68
qs_rsd_fail_why . . . . .	69
qs_rsd_test . . . . .	70
qs_rsd_warn_why . . . . .	71
qs_seasonal_fail_why . . . . .	72
qs_seasonal_test . . . . .	73
qs_seasonal_warn_why . . . . .	74
qs_series . . . . .	75
qs_test . . . . .	76
qs_warn_why . . . . .	77
replace_na . . . . .	78
r_terror . . . . .	79
r_terror_list . . . . .	80
save_metafile . . . . .	81
save_seas_object . . . . .	82
save_series . . . . .	84
save_spec_file . . . . .	85
save_spec_file_vec . . . . .	86
seasonal_ftest . . . . .	88
set_critical_value . . . . .	89
set_legend_position . . . . .	90
shoes2007 . . . . .	91
shoes2008 . . . . .	91
spec_peak_fail_why . . . . .	92
spec_peak_test . . . . .	93
spec_peak_warn_why . . . . .	94
sspan_test . . . . .	95
sspan_test_why . . . . .	96
static_with_outlier . . . . .	97
static_with_outlier_list . . . . .	98
udg_series . . . . .	99
unemployment_data_mts . . . . .	100
unemployment_list . . . . .	100
update_diag_matrix . . . . .	101
update_vector . . . . .	102
which_error . . . . .	103
xt_data_list . . . . .	103
xt_data_new . . . . .	104
xt_data_old . . . . .	105

---

absmax	<i>Maximum absolute value of a vector</i>
--------	---

---

**Description**

Generates the maximum of the absolute value of a numeric vector.

**Usage**

```
absmax(x)
```

**Arguments**

x	vector of numbers
---	-------------------

**Details**

Version 1.3, 3/29/2021

**Value**

Maximum of the absolute value of a vector

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
r50 <- rnorm(50)
r50.absmax <- absmax(r50)
```

---

absolute_pct_diff	<i>Generate the either the average or median absolute percentage difference between two vectors</i>
-------------------	---

---

**Description**

Generate the average absolute percentage difference (AAPD) or median absolute percentage difference (MAPD) between two vectors - the vectors must be the same length.

**Usage**

```
absolute_pct_diff(x1 = NULL, x2 = NULL, use_median = FALSE)
```

**Arguments**

x1	numeric vector; This is a required entry.
x2	numeric vector; This is a required entry, and must be the same length as x1.
use_median	logical scalar, if TRUE, returns the median of the absolute percentage difference; if FALSE, returns the average of the absolute percentage difference Default is FALSE.

**Details**

Version 2.0, 6/21/2024

**Value**

Either the average or median absolute percentage difference of the two series.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_seats_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_x11_sa <- seasonal::final(ukgas_seas)
ukgas_seats_sa <- seasonal::final(ukgas_seats_seas)
ukgas_sa_aapd <-
  sautilities::absolute_pct_diff(ukgas_seats_sa, ukgas_x11_sa)
ukgas_sa_mapd <-
  sautilities::absolute_pct_diff(ukgas_seats_sa, ukgas_x11_sa, use_median = TRUE)
```

---

acf\_fail

*ACF Test failure message*

---

**Description**

Tests whether the sample autocorrelation of the residuals from a time series model fails the Ljung-Box or Box-Pierce Q test.

**Usage**

```
acf_fail(
  udg_list = NULL,
  acf_lags_fail = c(1, 2, 3, 4, 12, 24),
  num_sig = 8,
  include_pacf = TRUE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
acf_lags_fail	Lags of the ACF to test Default is c(1, 2, 3, 4, 8).
num_sig	Limit for number of lags with significant ACF values Default is 4.
include_pacf	Logical scalar that indicates if the PACF is included in the testing. Default is TRUE

Details

Version 3.2, 2024-05-15

Value

Logical object which is TRUE if series fails the ACF test, FALSE otherwise

Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

Examples

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_acf_fail <- acf_fail(ukgas_udg, acf_lags_fail = c(1, 2, 3, 4, 8), num_sig = 4)
```

acf_fail_why	ACF Test Explanation
--------------	----------------------

Description

Generates text on why the sample autocorrelation of the residuals from a time series model fails the Ljung-Box or Box-Pierce Q test.

Usage

```
acf_fail_why(
  udg_list = NULL,
  acf_lags_fail = c(1, 2, 3, 4, 12, 24),
  num_sig = 8,
  include_pacf = TRUE,
  return_both = FALSE
)
```

Arguments

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
acf_lags_fail	• lags of the ACF to test Default is c(1, 2, 3, 4, 12, 24).
num_sig	• limit for number of lags with significant ACF values Default is 8.
include_pacf	Logical scalar that indicates if the PACF is included in the testing. Default is TRUE
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or just produce a warning. Default is FALSE.

Details

Version 4.1, 2024-05-15

**Value**

Character object that tells why series fails the ACF test, 'pass' otherwise.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_acf_fail_why <- acf_fail_why(ukgas_udg, acf_lags_fail = c(1, 2, 3, 4, 8),
                                   num_sig = 4, return_both = TRUE)
```

---

acf_test	<i>Global ACF test</i>
----------	------------------------

---

**Description**

Tests whether the residuals from a time series model has acceptable autocorrelation in the residuals.

**Usage**

```
acf_test(
  seas_obj = NULL,
  num_sig = 8,
  acf_lags_fail = c(1, 2, 3, 4, 12, 24),
  acf_lags_warn = c(12, 24),
  include_pacf = TRUE,
  return_this = "test"
)
```

**Arguments**

seas_obj	Object generated by seas() of the seasonal package. This is a required entry.
num_sig	Limit for number of lags with significant ACF values Default is 8.
acf_lags_fail	• lags of the ACF to test Default is c(1, 2, 3, 4, 12, 24).
acf_lags_warn	• lags of the ACF to test for warnings Default is c(12, 24).
include_pacf	Logical scalar that indicates if the PACF is included in the testing. Default is TRUE
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 4.4, 5/15/2024

**Value**

A text string denoting if series passes, fails, or has a warning for residual autocorrelation. If model diagnostics not found, return 'none'.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_acf_test <- acf_test(ukgas_seas, num_sig = 4, acf_lags_fail = c(1, 2, 3, 4, 8),
                           acf_lags_warn = c(4, 8), return_this = "both")
```

---

acf_warn	<i>ACF test warning message</i>
----------	---------------------------------

---

**Description**

Tests whether the residuals from a time series model generates a warning for the ACF test.

**Usage**

```
acf_warn(udg_list = NULL, acf_lags_warn = c(12, 24))
```

**Arguments**

- |               |  |
|---------------|--|
| udg_list      | • list object generated by udg() function of the seasonal package. |
| acf_lags_warn | • lags of the ACF to test for warnings                             |

**Details**

Version 2.6, 05/15/2024

**Value**

Logical object which is TRUE if series generates a warning for the ACF test, FALSE otherwise.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_acf_warn <- acf_warn(ukgas_udg, acf_lags_warn = c(4,8))
```



acf\_warn\_why

*ACF Test Warning Message***Description**

Generates text on why the sample autocorrelation of the residuals from a time series model fails the Ljung-Box or Box-Pierce Q test

**Usage**

```
acf_warn_why(udg_list = NULL, acf_lags_warn = c(12, 24), return_both = FALSE)
```

**Arguments**

- |               |   |
|---------------|---|
| udg_list      | • list object generated by udg() function of the seasonal package. This is a required entry.  |
| acf_lags_warn | • lags of the ACF to test for warnings Default is c(12, 24).  |
| return_both   | Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE. |

**Details**

Version 3.5, 5/25/2023

**Value**

Character string which tells why the series generates a warning for the ACF test, 'pass' otherwise.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_acf_warn_why <- acf_warn_why(ukgas_udg, acf_lags_warn = c(4, 8), return_both = TRUE)
```

---

all_model_diag	<i>Model diagnostic summary</i>
----------------	---------------------------------

---

## Description

Generate a summary of model diagnostics for a single series

## Usage

```
all_model_diag(
  seas_obj = NULL,
  add_aicc = FALSE,
  add_norm = FALSE,
  add_auto_out = FALSE,
  add_seasonal = FALSE,
  add_spec = FALSE,
  add_lbq = TRUE,
  set_lbq_lags_fail = c(12, 24),
  set_lbq_p_limit = 0.01,
  set_acf_num_sig = 8,
  set_acf_lags_fail = c(1, 2, 3, 4, 12, 24),
  set_acf_lags_warn = c(12, 24),
  add_pacf = TRUE,
  qs_test_span = FALSE,
  set_qs_p_limit_pass = 0.01,
  set_qs_p_limit_warn = 0.05,
  set_qs_robust_sa = TRUE,
  set_spec_peak_level = 6,
  set_spec_peak_warn = 3,
  return_list = FALSE
)
```

## Arguments

seas_obj	seas object generated from a call of seas on a single time series This is a required entry.
add_aicc	logical scalar; add AICC value to the summary. Default is FALSE
add_norm	logical scalar; add normality statistics to the summary. Default is FALSE
add_auto_out	logical scalar; add identified automatic outliers to the summary. Default is FALSE
add_seasonal	logical scalar; add QS test for seasonality to the summary. Default is FALSE.
add_spec	logical scalar; add test for spectral peaks to the summary. Default is FALSE.
add_lbq	logical scalar; add test for Ljung-Box Q to the summary. Default is TRUE; if set to FALSE, a more extensive test of ACF will be done.
set_lbq_lags_fail	<ul style="list-style-type: none"> <li>lags of the Ljung-Box Q to test Default is c(12, 24).</li> </ul>
set_lbq_p_limit	Numeric scalar; P-value limit for Ljung-Box Q test Default is 0.01.
set_acf_num_sig	Limit for number of lags with significant ACF values Default is 8.

set\_acf\_lags\_fail
 

- lags of the ACF to test Default is c(1, 2, 3, 4, 12, 24).

set\_acf\_lags\_warn
 

- lags of the ACF to test for warnings Default is c(12, 24).

add\_pacf        logical scalar; include PACF in ACF results. Default is TRUE.

qs\_test\_span    logical scalar; test span of data in QS seasonal test rather than full series. Default is FALSE

set\_qs\_p\_limit\_pass        Numeric scalar; P-value limit for QS statistic for passing Default is 0.01.

set\_qs\_p\_limit\_warn        Numeric scalar; P-value limit for QS statistic for warning Default is 0.05.

set\_qs\_robust\_sa        Logical scalar indicating if original series adjusted for extremes is included in testing. Default is TRUE.

set\_spec\_peak\_level        Integer scalar - limit to determine if a frequency has a spectral peak. Default is 6.

set\_spec\_peak\_warn        Integer scalar - limit to produce a warning that a frequency may have a spectral peak. Default is 3.

return\_list        logical scalar; return a list rather than a vector. Default is FALSE

## Details

Version 5.5, 6/21/2024

## Value

vector or list of model diagnostics for a given series

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```

air_seas <-
  seasonal::seas(AirPassengers, x11="", slidingspans = "",
    transform.function = "log", arima.model = "(0 1 1)(0 1 1)",
    regression.aictest = "td", forecast.maxlead=36,
    check.print = c( "pacf", "pacfplot" ), check.save = "acf")
air_diag <-
  all_model_diag(air_seas, add_seasonal = TRUE, add_aicc = TRUE, add_norm = TRUE,
    add_auto_out = TRUE, add_pacf = FALSE, qs_test_span = TRUE,
    return_list = TRUE)
  
```

---

all\_model\_diag\_list     *Model diagnostic summary from a list*


---

## Description

Generate a summary of model diagnostics from a list of seas objects series.

## Usage

```
all_model_diag_list(
  seas_obj_list = NULL,
  add_aicc = FALSE,
  add_norm = FALSE,
  add_auto_out = FALSE,
  add_seasonal = FALSE,
  add_spec = FALSE,
  add_lbq = TRUE,
  set_lbq_lags_fail = c(12, 24),
  set_lbq_p_limit = 0.01,
  set_acf_num_sig = 8,
  set_acf_lags_fail = c(1, 2, 3, 4, 12, 24),
  set_acf_lags_warn = c(12, 24),
  add_pacf = TRUE,
  qs_test_span = FALSE,
  set_qs_p_limit_pass = 0.01,
  set_qs_p_limit_warn = 0.05,
  set_qs_robust_sa = TRUE,
  set_spec_peak_level = 6,
  set_spec_peak_warn = 3,
  return_data_frame = FALSE
)
```

## Arguments

seas_obj_list	list of seas objects generated from a call of seas on a single time series. A required argument.
add_aicc	logical scalar; add AICC value to the summary. Default is TRUE
add_norm	logical scalar; add normality statistics to the summary. Default is FALSE
add_auto_out	logical scalar; add identified automatic outliers to the summary. Default is FALSE
add_seasonal	logical scalar; add QS test for seasonality to the summary. Default is FALSE.
add_spec	logical scalar; add test for spectral peaks to the summary. Default is FALSE
add_lbq	logical scalar; add test for Ljung-Box Q to the summary. Default is TRUE; if set to FALSE, a more extensive test of ACF will be done.
set_lbq_lags_fail	<ul style="list-style-type: none"> <li>lags of the Ljung-Box Q to test Default is c(12, 24).</li> </ul>
set_lbq_p_limit	Numeric scalar; P-value limit for Ljung-Box Q test Default is 0.01.
set_acf_num_sig	Limit for number of lags with significant ACF values Default is 8.

set\_acf\_lags\_fail  
     • lags of the ACF to test Default is c(1, 2, 3, 4, 12, 24).

set\_acf\_lags\_warn  
     • lags of the ACF to test for warnings Default is c(12, 24).

add\_pacf           logical scalar; include PACF in ACF results. Default is TRUE

qs\_test\_span       logical scalar; test span of data in QS seasonal test rather than full series. Default is FALSE

set\_qs\_p\_limit\_pass  
     Numeric scalar; P-value limit for QS statistic for passing Default is 0.01.

set\_qs\_p\_limit\_warn  
     Numeric scalar; P-value limit for QS statistic for warning Default is 0.05.

set\_qs\_robust\_sa  
     Logical scalar indicating if original series adjusted for extremes is included in testing. Default is TRUE.

set\_spec\_peak\_level  
     Integer scalar - limit to determine if a frequency has a spectral peak. Default is 6.

set\_spec\_peak\_warn  
     Integer scalar - limit to produce a warning that a frequency may have a spectral peak. Default is 3.

return\_data\_frame  
     logical scalar; if TRUE, return a data frame of the diagnostics, otherwise return a matrix. Default is FALSE.

## Details

Version 8.0, 6/21/2024

## Value

matrix or data frame of model diagnostics for a given set of series series

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsel@gmail.com>

## Examples

```

unemp_seas_list <-
  seasonal::seas(unemployment_list, slidingspans = "",
    transform.function = "log",
    outlier.types = "all",
    arima.model = "(0 1 1)(0 1 1)",
    forecast.maxlead=36, x11 = "",
    check.print = c( "pacf", "pacfplot" ),
    check.save = "acf")
unemp_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas_list)
unemp_diag <-
  all_model_diag_list(unemp_seas_update, add_aicc = TRUE,
    add_norm = TRUE, add_auto_out = TRUE,
    add_spec = TRUE, add_pacf = FALSE, qs_test_span = TRUE)
  
```

check\_stats

*Displays various X-13 diagnostics***Description**

Displays various X-13 diagnostics for a single series. Adapted from a script developed by Osbert Pang (US Census Bureau, osbert.c.pang@census.gov)

**Usage**

```
check_stats(
  seas_obj = NULL,
  print_summary = TRUE,
  test_full = TRUE,
  test_span = TRUE,
  acf_num_sig = 8,
  acf_lags_fail = c(1, 2, 3, 4, 12, 24),
  acf_lags_warn = c(12, 24),
  model_t_value = 3,
  model_p_value = 0.05,
  otl_auto_limit = 5,
  otl_all_limit = 5,
  d11f_p_level = 0.01,
  qs_p_limit_pass = 0.01,
  qs_p_limit_warn = 0.05,
  qs_p_limit_fail = 0.01,
  qs_robust_sa = TRUE,
  sf_limit = 25,
  change_limit = 40,
  mq_fail_limit = 1.2,
  mq_warn_limit = 0.8,
  return_list = FALSE
)
```

**Arguments**

seas_obj	object generated by seas() of the seasonal package.
print_summary	Logical object; if TRUE, print the result of summary(seas_obj); if FALSE, a model summary will be printed out. Default is TRUE.
test_full	Logical scalar indicating whether to apply the QS test to the full series span. Default is TRUE.
test_span	Logical scalar indicating whether to test the QS test to the final 8-year span used by the spectrum diagnostic. Default is TRUE.
acf_num_sig	Numeric object; limit for number of lags with significant ACF values. Default is 8.
acf_lags_fail	Numeric vector; lags of the ACF to test. Default is c(1, 2, 3, 4, 12, 24).
acf_lags_warn	Numeric vector; lags of the ACF to test for warnings, Default is c(12, 24).
model_t_value	t-statistic limit for regressors. Default is 3.0.
model_p_value	p-value limit for regressors. Default is 0.05.

otl_auto_limit	limit for number of automatically identified outliers. Default is 5.
otl_all_limit	limit for number of outlier regressors. Default is 5.
d11f_p_level	p-level used to test the d11 f-test for residual seasonality. Default is 0.01.
qs_p_limit_pass	Numeric scalar; P-value limit for QS statistic for passing. Default is 0.01.
qs_p_limit_warn	Numeric scalar; P-value limit for QS statistic for warning. Default is 0.05.
qs_p_limit_fail	Numeric scalar; P-value limit for QS statistic for failing. Default is 0.01.
qs_robust_sa	Logical scalar indicating if original series adjusted for extremes is included in testing. Default is TRUE.
sf_limit	Numeric object; limit for the percentage of seasonal spans flagged. Default is 25.
change_limit	Numeric object; limit for the percentage of month-to-month changes flagged. Default is 40.
mq_fail_limit	Numeric scalar; value above which the M or Q statistic fails. Default is 1.2.
mq_warn_limit	Numeric scalar; value above which the M or Q statistic gives a warning message if it is less than this_fail_limit, Default is 0.8.
return_list	Logical scalar; indicates if the function will return a summary of diagnostics. Default is TRUE.

## Details

Version 3.6, 5/15/2024

## Value

Displays assorted seasonal adjustment and modeling diagnostics.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_check_stats <-
  check_stats(ukgas_seas, acf_num_sig = 5, acf_lags_fail = c(1, 2, 3, 4, 8),
    acf_lags_warn = c(4, 8), otl_auto_limit = 4, otl_all_limit = 6,
    return_list = TRUE)
```

---

choose\_optimal\_seasonal\_filter

*Choose Optimal X-11 seasonal moving average*


---

## Description

Choose the optimal X-11 seasonal moving average based on the value of the seasonal moving average coefficient from an airline model.

## Usage

```
choose_optimal_seasonal_filter(
  this_seasonal_theta = NULL,
  dp_limits = TRUE,
  use_3x15 = TRUE
)
```

## Arguments

this_seasonal_theta	numeric scalar; seasonal moving average coefficient from an airline model. This is a required entry.
dp_limits	logical scalar, if TRUE limits from Deputot and Planas will be used to choose the moving average, else limits from Bell Chow and Chu will be used. Default is TRUE.
use_3x15	logical scalar, if TRUE 3x15 seasonal filter will be returned if chosen, otherwise function will return a 3x9 value. Default is FALSE.

## Details

Version 1.4, 5/23/2023

## Value

The optimal X-11 seasonal filter, unless the airline model cannot be estimated. Uses the result from get\_seasonal\_theta; if this isn't a null value, return choice of optimal seasonal moving average

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
shoes_seas <- seasonal::seas(shoes2008, x11="", slidingspans = "",
  transform.function = "log", x11 = "",
  arima.model = "(0 1 1)(0 1 1)",
  regression.aictest = c("td", "easter"),
  forecast.maxlead=36, check.print = c( "pacf", "pacfplot" ))
shoes_seasonal_MA <- shoes_seas$est$coefficients[["MA-Seasonal-12"]]
this_seasonal <- choose_optimal_seasonal_filter(shoes_seasonal_MA)
this_seasonal2 <- choose_optimal_seasonal_filter(shoes_seasonal_MA, dp_limits = FALSE)
```



---

combined\_spectrum\_test

*Combined spectrum test from Maravall (2012)*


---

## Description

Generate a test for seasonality by combining the results from the AR(30) and Tukey nonparametric spectrums as laid out in Maravall (2012)

## Usage

```
combined_spectrum_test(
  seas_obj = NULL,
  this_ar_spec_cv = NULL,
  this_series = "series.adjoriginal",
  take_log = TRUE,
  take_diff = TRUE
)
```

## Arguments

seas_obj	seas object for a single series. This is a required entry.
this_ar_spec_cv	List object with two elements - 99 and 95 percent critical values for the frequencies of the AR(30) spectrum as generated by the gen_ar_spec_cv
this_series	character string; the table used to generate the AR(30) spectrum. Default is "b1".
take_log	logical scalar; indicates if the AR spectrum is generated from the log of the data. Default is TRUE.
take_diff	logical scalar; indicates if the data is differenced before the AR spectrum is generated. Default is TRUE.

## Details

Version 2.7, 5/14/2024

## Value

TRUE if spectral evidence of seasonality is detected; FALSE if not.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
air_seas <- seasonal::seas(AirPassengers, series.save = "b1",
  arima.model="(0 1 1)(0 1 1)",
  forecast.maxlead = 36, slidingspans = "",
  transform.function = "log")
this_ar30_spec_cv <- gen_ar_spec_cv(1000, 97, 12)
this_spectrum_test <- combined_spectrum_test(air_seas, this_ar30_spec_cv)
```

---

compare_dates	<i>Date Match</i>
---------------	-------------------

---

**Description**

Compare two dates to see if they match.

**Usage**

```
compare_dates(this_date = NULL, comp_date = NULL)
```

**Arguments**

this_date	Integer array of length 2, a date where the first element is the year and the second element is the month or quarter. This is a required entry.
comp_date	Integer array of length 2, a date to compare to this_date.

**Details**

Version 3.2, 5/23/2023

**Value**

Logical scalar; TRUE if the dates match, FALSE if they don't.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
match_start <- compare_dates(start(shoes2007), c(1990,1))
```

---

convert_date_string_to_date	<i>Convert date string from UDG output</i>
-----------------------------	--

---

**Description**

convert a date string from the X-13 UDG file to a c(year, month) date

**Usage**

```
convert_date_string_to_date(this_date_string)
```

**Arguments**

this_date_string	date string usually extracted from the X-13 UDG output
------------------	--

**Details**

Version 1.1, 4/22/2021

**Value**

integer array of length 2 with the year and month/quarter of from the date string

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers,
                           arima.model="(0 1 1)(0 1 1)",
                           forecast.maxlead = 36, slidingspans = "",
                           transform.function = "log")
this_start_spec_string <- seasonal::udg(air_seas, "startspec")
this_start_spec       <- convert_date_string_to_date(this_start_spec_string)
```

---

d11f_test	<i>D11 F-test for residual seasonality</i>
-----------	--

---

**Description**

Generates X-11's f-test for residual seasonality in the seasonally adjusted data.

**Usage**

```
d11f_test(seas_obj = NULL, p_level = 0.01, return_this = "test")
```

**Arguments**

seas_obj	Object generated by seas() of the seasonal package. This is a required entry.
p_level	p-level used to test the d11 f-test for residual seasonality Default is 0.01.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 4.3, 5/14/2024

**Value**

A text string denoting if series passes or has a warning for residual seasonality. If d11f statistic not found, return 'none'.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_d11f_test <- d11f_test(ukgas_seas, p_level = 0.05, return_this = 'both')
```

---

d11f\_test\_why

---

*ACF Test Warning Message*


---

**Description**

Shows why D11 f-test for residual seasonality fails.

**Usage**

```
d11f_test_why(udg_list = NULL, p_level = 0.01, return_both = FALSE)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
p_level	p-level used to test the d11 f-test for residual seasonality Default is 0.01.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

**Details**

Version 4.2, 5/24/2023

**Value**

A text string denoting why a series fails or has a warning for residual seasonality. If d11f statistic not found, return 'none'.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                 x11="", transform.function = "log", forecast.maxlead=20,
                 check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_d11f_why <- d11f_test_why(ukgas_udg, p_level = 0.05, return_both = TRUE)
```

---

employment_data_mts	<i>US Employment Series, four main components in an mts object</i>
---------------------	--

---

**Description**

An mts object of the four main components of US Employment expressed as time series objects that end in December, 2022

**Usage**

```
employment_data_mts
```

**Format**

An mts object with 4 time series elements in four columns:

**n2000013** Employed Males 16-19

**n2000014** Employed Females 16-19

**n2000025** Employed Males 20+

**n2000026** Employed Females 20+

---

employment_list	<i>US Employment Series, four main components in a list object</i>
-----------------	--

---

**Description**

A list object of the four main components of US Employment expressed as time series objects that end in December, 2022

**Usage**

```
employment_list
```

**Format**

A list object with 4 time series elements:

**n2000013** Employed Males 16-19

**n2000014** Employed Females 16-19

**n2000025** Employed Males 20+

**n2000026** Employed Females 20+

---

fix_diag_list	<i>Fix Diagnostic List</i>
---------------	----------------------------

---

## Description

Fix an incomplete diagnostic list by filling in missing elements with NAs

## Usage

```
fix_diag_list(this_test = NULL, this_names = NULL, return_this = "both")
```

## Arguments

this_test	list object of a seasonal adjustment or modeling diagnostic This is a required entry.
this_names	character vector; complete set of names to check against This is a required entry.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'both'.

## Details

Version 1.6, 5/25/2023

## Value

diagnostic list object with missing names filled in

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
xt_composite_seas <- seasonal::seas(xt_data_new,
  transform.function = "log",
  check.print = c("none", "+acf", "+acfplot", "+normalitytest"),
  regression.aictest = NULL,
  outlier.types = "all",
  arima.model = "(0 1 1)(0 1 1)",
  list = list(
    list(x11 = ""),
    list(x11 = ""),
    list(seats.save = c("s11", "s12", "s10")),
    list(x11 = "")
  ),
)
xt_comp_update <-
  Filter(function(x) inherits(x, "seas"), xt_composite_seas)
xt_test_m7 <- lapply(xt_comp_update, function(x)
  try(mq_test(x, return_this = 'both'))))
test_names <- names(xt_data_new)
num_names <- length(test_names)
if (!is.null(xt_test_m7)) {
```

```

    if (length(xt_test_m7) < num_names) {
      xt_test_m7 <-
        fix_diag_list(xt_test_m7, test_names, return_this = 'both')
    }
  }
}

```

---

gen_ao_outlier_ts	<i>Generate level change regression variable as a ts object</i>
-------------------	---

---

## Description

Generates a ts object for a AO (point) outlier regressor.

## Usage

```

gen_ao_outlier_ts(
  ao_date,
  this_start,
  this_end,
  this_freq = 12,
  return_matrix = TRUE
)

```

## Arguments

ao_date	Integer vector of length two - dates for AO outlier to be generated.
this_start	Numeric vector; start date of AO outlier regressor generated.
this_end	Numeric vector; end date of AO outlier regressor generated.
this_freq	Numeric scalar; frequency of time series. Default: 12, for a monthly series.
return_matrix	Logical scalar; If true, the object returned is a one column time series matrix object. Default: TRUE

## Details

Version 1.7, 5/23/2023

## Value

A ts object of a point outlier regressor.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```

UKgas_ao_date <- c(1970, 2)
UKgas_ao_1970_2 <-
  gen_ao_outlier_ts(UKgas_ao_date, this_start = c(1960, 1), this_end = c(1990, 4),
    this_freq = 4)

```

---

gen_ar_spec_cv	<i>AR(30) Spectrum Critical Value</i>
----------------	---------------------------------------

---

### Description

Generate critical values for AR(30) spectrum as in Maravall (2012).

### Usage

```
gen_ar_spec_cv(n_sim = 1e+05, series_length = 121, freq = 12)
```

### Arguments

n_sim	integer scalar; number of simulations; default is 100000
series_length	integer scalar; length of each series simulated. Default is 121.
freq	integer scalar; frequency of the time series; default is 12 (monthly).

### Details

Version 1.5, 5/25/2023

### Value

List of critical values for each seasonal frequency for the 95th and 99th percentile.

### Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

### Examples

```
ar30_spec_cv <- gen_ar_spec_cv(1000, 97, 12)
```

---

gen_hybrid_sa	<i>Generate a hybrid seasonal adjustment</i>
---------------	--

---

### Description

Generates a "hybrid" seasonal adjustment by replacing a span of a multiplicative seasonal adjustment with an additive adjustment.

### Usage

```
gen_hybrid_sa(
  this_mult_sa = NULL,
  this_add_sa = NULL,
  this_start_hybrid = NULL,
  this_end_hybrid = NULL
)
```



**Arguments**

`this_mult_sa` time series object of a multiplicative seasonal adjustment This is a required entry.

`this_add_sa` time series object of an additive seasonal adjustment This is a required entry.

`this_start_hybrid` integer vector of length 2, start of the span where additive adjustments replace multiplicative adjustment. This is a required entry.

`this_end_hybrid` integer vector of length 2, end of the span where additive adjustments replace multiplicative adjustment. This is a required entry.

**Details**

Version 2.2, 5/25/2023

**Value**

time series object with hybrid seasonal adjustment.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_mult_seas <- seasonal::seas(AirPassengers, transform.function = "log")
air_mult_sa   <- seasonal::final(air_mult_seas)
air_add_seas  <- seasonal::seas(AirPassengers, transform.function = "none")
air_add_sa    <- seasonal::final(air_add_seas)
air_hybrid_sa <- gen_hybrid_sa(air_mult_sa, air_add_sa, c(1956,1), c(1956,12))
```

---

<code>gen_ls_outlier_ts</code>	<i>Level change regression variable as a ts object</i>
--------------------------------	--

---

**Description**

Generates a ts object for a LS (level shift) outlier regressor.

**Usage**

```
gen_ls_outlier_ts(
  ls_date,
  this_start,
  this_end,
  this_freq = 12,
  x13type = TRUE,
  return_matrix = TRUE
)
```

**Arguments**

ls_date	Integer vector of length two - dates for LS outlier to be generated.
this_start	Numeric vector; start date of LS outlier regressor generated.
this_end	Numeric vector; end date of LS outlier regressor generated.
this_freq	Numeric scalar; frequency of time series. Default: 12, for a monthly series
x13type	Logical scalar; Indicates if level change outlier is defined as in X-13ARIMA-SEATS. Default: TRUE
return_matrix	Logical scalar; If true, the object returned is a one column time series matrix object. Default: TRUE

**Details**

Version 1.8, 5/23/2023

**Value**

Generate ts object of a level change outlier regressor

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
UKgas_ls_date <- c(1970, 2)
UKgas_ls_1970_2 <-
  gen_ls_outlier_ts(UKgas_ls_date, this_start = c(1960, 1), this_end = c(1990, 4),
    this_freq = 4)
```

---

gen_tc_outlier_ts	<i>Temporary change outlier regression as a ts object</i>
-------------------	---

---

**Description**

Generates a ts object for a TC (temporary change) outlier regressor

**Usage**

```
gen_tc_outlier_ts(
  tc_date = NULL,
  this_start = NULL,
  this_end = NULL,
  this_freq = 12,
  tc_alpha = NULL,
  return_matrix = TRUE
)
```

**Arguments**

tc_date	Integer vector of length two - dates for TC outlier to be generated This is a required entry.
this_start	Numeric vector; start date of TC outlier regressor generated. This is a required entry.
this_end	Numeric vector; end date of TC outlier regressor generated. This is a required entry.
this_freq	Numeric scalar; frequency of time series. Default: 12, for a monthly series
tc_alpha	Numeric scalar; Rate of decay for the TC outlier. Default: will be computed as in X-13ARIMA-SEATS for a weekly series
return_matrix	Logical scalar; If true, the object returned is a one column time series matrix object. Default: TRUE

**Details**

Version 1.7, 5/25/2023

**Value**

ts object for a temporary change outlier regressor

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
UKgas_tc_date <- c(1970, 2)
UKgas_tc_1970_2 <-
  gen_tc_outlier_ts(UKgas_tc_date, this_start = c(1960, 1), this_end = c(1990, 4),
    this_freq = 4, tc_alpha = 0.9, return_matrix = TRUE)
```

---

gen_x13_table_list	<i>X-13 Tables Available</i>
--------------------	------------------------------

---

**Description**

Generates a list of X-13 tables that can be extracted with the seasonal package.

**Usage**

```
gen_x13_table_list(this_table_type = "all")
```

**Arguments**

this\_table\_type  
vector of character strings listing types of X-13 tables to output. Default is 'all', other choices are 'diagnostics', 'matrices', 'spectrum', 'timeseries'.

**Details**

Version 2.4, 05/24/2023

**Value**

A list of arrays with table names and abbreviations from X-13ARIMA-SEATS in several different elements specified by the user: diagnostics, matrices, spectrum, timeseries

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsel@gmail.com>

**Examples**

```
x13_tables_all <- gen_x13_table_list()
```

---

get_acf	<i>get ACF values, diagnostics</i>
---------	------------------------------------

---

**Description**

Extract values from the sample ACF of the regARIMA model residuals, along with Ljung-Box Q values.

**Usage**

```
get_acf(
  seas_obj = NULL,
  lags = NULL,
  as_data_frame = TRUE,
  add_rownames = TRUE
)
```

**Arguments**

seas_obj	seas object generated by the seasonal package. This is a required entry.
lags	An array of integer lags to extract from the ACF output. If not specified, all lags will be returned.
as_data_frame	Logical scalar. If TRUE, the values are returned as a data frame. If FALSE, the result is returned as a matrix object. Default is TRUE.
add_rownames	Logical scalar. If TRUE, row names are constructed from the lags specified by the user. If FALSE, no rownames will be added. Default is TRUE.

**Details**

Version 2.0, 5/21/2024

**Value**

A data frame (or matrix) with 5 columns: "Sample\_ACF" (sample ACF Value), "SE\_of\_ACF" (ACF standard error), "Ljung.Box\_Q" (Ljung-Box Q statistic), "df\_of\_Q" (degrees of freedom for Ljung=Box Q), and "P.value" (p-value for Ljung Box Q).

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers,
  arima.model="(0 1 1)(0 1 1)",
  check.save = "acf",
  check.maxlag = 36,
  forecast.maxlead = 36, slidingspans = "",
  transform.function = "log")
air_acf_df <- get_acf(air_seas, lags = c(1,2,3,12,13,24))
```

---

```
get_arima_estimates_matrix
```

*ARMA Coefficient Summary*

---

**Description**

Generate a summary of ARMA coefficients for a single series.

**Usage**

```
get_arima_estimates_matrix(seas_obj = NULL, add_diff = FALSE)
```

**Arguments**

seas_obj	seas object generated from a call of seas on a single time series. This is a required entry.
add_diff	logical scalar; add differencing information, if included in model

**Details**

Version 3.2, 5/14/2024

**Value**

matrix of ARMA coefficients, standard errors, and t-statistics for a given series

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <-
  seasonal::seas(AirPassengers, x11="", slidingspans = "", transform.function = "log",
    arima.model = "(0 1 1)(0 1 1)", regression.aictest = 'td',
    forecast.maxlead=36, check.print = c( "pacf", "pacfplot" ))
air_arima_matrix <- get_arima_estimates_matrix(air_seas, add_diff = TRUE)
```

---

```
get_auto_outlier_string
```

*Get automatic outlier names*

---

### Description

Get the names of outliers identified in the seas object for a single series.

### Usage

```
get_auto_outlier_string(seas_obj = NULL)
```

### Arguments

**seas\_obj**            A seas object for a single series generated from the seasonal package. This is a required entry.

### Details

Version 3.0, 5/14/2024

### Value

Character string containing a summary of the outliers identified in the regARIMA model. If no regressors or automatic outliers in the model, the routine will return a blank character.

### Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

### Examples

```
air_seas <- seasonal::seas(AirPassengers, arima.model = "(0 1 1)(0 1 1)", x11="")
this_auto_outlier <- get_auto_outlier_string(air_seas)
```

---

```
get_fcst_tval
```

*T-values of within sample forecasts*

---

### Description

Returns t-values of within sample forecasts, up to 3

### Usage

```
get_fcst_tval(seas_obj = NULL, terror_lags = NULL)
```

### Arguments

**seas\_obj**            seas object for a single series This is a required entry.

**terror\_lags**        Integer scalar for number of forecast lags from the end of series we'll collect t-statistics. Must be either 1, 2, or 3. This is a required entry.

**Details**

Version 2.10, 5/14/2024

**Value**

A numeric array of t-values of within sample forecasts, up to length 3.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas_short <- seasonal::seas(AirPassengers, series.span = ',1960.9',
                                arima.model="(0 1 1)(0 1 1)", x11 = "",
                                forecast.maxlead = 36, slidingspans = "",
                                transform.function = "log")
fcst_tstat <- get_fcst_tval(air_seas_short, 3)
```

---

get_ftest_from_udg	<i>Get F-test info from external UDG file</i>
--------------------	---

---

**Description**

Parse udg file and get information for model-based F-test for a regressor.

**Usage**

```
get_ftest_from_udg(this_base = NULL, this_path = NULL, this_reg = "Seasonal")
```

**Arguments**

this_base	Character scalar; Filename of output file of the X-13 run. This is a required entry.
this_path	Character scalar; Path of udg file. This is an optional entry.
this_reg	Character scalar; Type of regressor for model-based F-test. Default is Seasonal.

**Details**

Version 1.1, 1/10/2024

**Value**

Numeric vector of the degrees of freedom, F-test, and p-value for this model based F-test

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
## Not run: this_ftest<-get_ftest_from_udg("AE1011330000_auto", "X:/code/census_build_60/basic/",
                                           "Trigonometric Seasonal")
## End(Not run)
```

---

get_model_ftest	<i>Get model based F-test</i>
-----------------	-------------------------------

---

## Description

Extract values associated with the model based F-test specified by the `this_ftest` argument.

## Usage

```
get_model_ftest(seas_obj = NULL, this_ftest = "seasonal", return_this = "all")
```

## Arguments

<code>seas_obj</code>	A seas object for a single series generated from the seasonal package This is a required entry.
<code>this_ftest</code>	Character string; type of model based f-test to return. Default is "seasonal"; only other acceptable value is "td".
<code>return_this</code>	Character string, Code that controls what values are returned. Acceptable values are "all", "dof" (degrees of freedom), "ftest", (F-test value), or "pval" (F-test p-value). Default is "all".

## Details

Version 3.8, 5/15/2024

## Value

Numeric vector with seasonal or trading day F-statistic, degrees of freedom, p-value. If not found, return NULL.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
air_seas_td_seasonal <-
  seasonal::seas(AirPassengers, arima.model = "(0 1 1)",
    regression.variables = c("seasonal", "td"), x11="")
this_seas_ftest <- get_model_ftest(air_seas_td_seasonal, this_ftest = "seasonal",
  return_this = "ftest")
this_td_ftest <- get_model_ftest(air_seas_td_seasonal, this_ftest = "td",
  return_this = "ftest")
```



---

get_month_index	<i>Generate index of month abbreviation</i>
-----------------	---

---

**Description**

Process string of month abbreviation to return a numeric index .

**Usage**

```
get_month_index(this_month_string)
```

**Arguments**

this_month_string	Character string; 3 character abbreviation of month
-------------------	---

**Details**

Version 2.3, September 18, 2020

**Value**

Index of month - 1 for 'Jan', 2 for 'Feb', etc.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
this0t1 <- 'A02015.Jan'
thisCode <- 'A0'
thisPerChar <- substr(this0t1,nchar(thisCode)+6,nchar(this0t1))
thisPerIndex <- get_month_index(thisPerChar)
```

---

get_mq_key	<i>Make a UDG key for X-11-ARIMA M and Q statistics</i>
------------	---

---

**Description**

Generates the UDG key for X-11-ARIMA M and Q statistics based on a label

**Usage**

```
get_mq_key(this_label = NULL)
```

**Arguments**

this_label	character string; name of an X-11-ARIMA M and Q statistics This is a required entry.
------------	--

**Details**

Version 1.3, 05/24/2023

**Value**

character string with the corresponding UDG label for this\_label. If incorrect label is specified, returns NULL.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
m7_key <- get_mq_key('M7')
```

---

get_mq_label	<i>Make a label for X-11-ARIMA M and Q statistics</i>
--------------	---

---

**Description**

Generates a label for X-11-ARIMA M and Q statistics

**Usage**

```
get_mq_label(this_key = "f3.q")
```

**Arguments**

this_key	character string; name of an X-11-ARIMA M and Q statistics used in the UDG X-13 output. Default is "f3.q".
----------	--

**Details**

Version 1.2, 05/24/2023

**Value**

character string with the corresponding label for this\_key. If incorrect label is specified, returns NULL.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
m7_label <- get_mq_label('f3.m07')
```

---

get\_nonseasonal\_theta *Nonseasonal Moving Average from Airline Model*


---

## Description

Get the value of a nonseasonal moving average coefficient estimated from an airline model.

## Usage

```
get_nonseasonal_theta(
  seas_obj = NULL,
  this_index = 1,
  return_string = TRUE,
  significant_digits = 3
)
```

## Arguments

seas_obj	A seas object for a single series generated from the seasonal package. This is a required entry.
this_index	An integer scalar, an index of the vector values to be passed. Acceptable values are 1 (nonseasonal MA coefficient value), 2 (nonseasonal MA coefficient standard error), or 3 (t-value of the nonseasonal MA coefficient). Default is 1.
return_string	A Logical scalar; indicates whether value returned is a string or numeric. Default is TRUE.
significant_digits	an integer scalar; significant digits to be saved when a string is returned. Default is 3.

## Details

Version 1.10, May 14, 2024

## Value

Character string containing a value related to the seasonal MA coefficient from the regARIMA model fit in the seas object seas\_obj. If return\_string is FALSE, this is a numeric. The standard error or t-value of the seasonal MA coefficient can be returned depending on the value of this\_index.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
air_seas <- seasonal::seas(AirPassengers, transform.function = "log",
  arima.model = "(0 1 1)(0 1 1)", x11="")
this_nonseasonal_theta <- get_nonseasonal_theta(air_seas, return_string = FALSE)
```

---

get_norm_stat	<i>Extract normality statistics from X-13</i>
---------------	---

---

**Description**

Extract normality statistics from the seas object of a single series

**Usage**

```
get_norm_stat(seas_obj = NULL, this_norm = NULL)
```

**Arguments**

- seas\_obj       seas object generated by the seasonal package for a single series. This is a required entry.
- this\_norm     character string; type of normality statistic being extracted. Permissible values are 'a', 'kurtosis', 'skewness'. This is a required entry.

**Details**

Version 3.6, 05/14/2024

**Value**

Double precision number for normality statistic described in this\_key. If incorrect this\_key used, function returns a NULL value. If normality statistic not generated in this run, function returns a NULL value.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers, slidingspans = "", transform.function = "log",
                           x11 = "", forecast.maxlead=36, check.print = c( "pacf", "pacfplot" ))
air_norm_stat <- get_norm_stat(air_seas, this_norm = 'kurtosis')
```

---

get_outlier_list	<i>List of outliers generated from a list of seasonal objects</i>
------------------	---

---

**Description**

Generate a summary of model outliers from a list of seas objects series.

**Usage**

```
get_outlier_list(seas_obj_list = NULL)
```

**Arguments**

`seas_obj_list` list of seas objects generated from a call of seas on a single time series. A required argument.

**Details**

Version 2.3, 5/7/2024

**Value**

vector of model diagnostics for a given series

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
unemp_seas_list <-
  seasonal::seas(unemployment_list, slidingspans = "",
    transform.function = "log",
    outlier.types = "all",
    arima.model = "(0 1 1)(0 1 1)",
    forecast.maxlead=36, x11 = "",
    check.print = c( "pacf", "pacfplot" ))
unemp_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas_list)
unemp_diag <-
  get_outlier_list(unemp_seas_update)
```

---

get\_regarima\_estimates\_matrix

*Generate summary of regARIMA model coefficients*

---

**Description**

Generate a summary of coefficients from a regARIMA model for a single series

**Usage**

```
get_regarima_estimates_matrix(
  seas_obj = NULL,
  add_diff = FALSE,
  this_xreg_names = NULL
)
```

**Arguments**

seas_obj	seas object generated from a call of seas on a single time series This is a required entry.
add_diff	logical scalar; add differencing information, if included in model
this_xreg_names	Character array; name of user defined regressors. Default is NULL, no user defined regressors. Number of names in this vector should match number of user-defined regressors; if not, a warning message will be produced.

**Details**

Version 2.5, 5/14/2024

**Value**

A matrix of regARIMA model coefficients, standard errors, and t-statistics for a given series

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers, x11="", slidingspans = "",
                           transform.function = "log", arima.model = "(0 1 1)(0 1 1)",
                           regression.aictest = 'td', forecast.maxlead=36,
                           check.print = c( "pacf", "pacfplot" ))
air_regarima_matrix <- get_regarima_estimates_matrix(air_seas)
```

---

get\_regression\_estimates\_matrix

*Generate regression coefficient summary*

---

**Description**

Generate a summary of regression coefficients for a single series

**Usage**

```
get_regression_estimates_matrix(seas_obj = NULL, this_xreg_names = NULL)
```

**Arguments**

seas_obj	seas object generated from a call of seas on a single time series This is a required entry.
this_xreg_names	Character array; name of user defined regressors. Default is NULL, no user defined regressors.

**Details**

Version 3.4, 5/14/2024

**Value**

matrix of regression coefficients, standard errors, and t-statistics for a given series

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers, x11="", slidingspans = "",
                           transform.function = "log", arima.model = "(0 1 1)(0 1 1)",
                           regression.aictest = 'td', forecast.maxlead=36,
                           check.print = c( "pacf", "pacfplot" ))
air_reg_matrix <- get_regression_estimates_matrix(air_seas)
```

---

get_reg_string	<i>Get names of regressors</i>
----------------	--------------------------------

---

**Description**

Generate string of names for the regressors used in the model fit for a given series

**Usage**

```
get_reg_string(seas_obj = NULL, xreg_names = NULL)
```

**Arguments**

seas_obj	seas object generated by the seasonal package for a single series. This is a required entry.
xreg_names	Character vector with names of user defined regressors used in model. Default is NULL, no user defined regressors. Number of names in this vector should match number of user-defined regressors; if not, a warning message will be produced.

**Details**

Version 2.9, 5/14/2024

**Value**

Character string containing a summary of the regressors in the regARIMA model. If no regressors in the model, the routine will return a blank character.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers, slidingspans = "",
                           transform.function = "log",
                           x11 = "", forecast.maxlead=36,
                           check.print = c( "pacf", "pacfplot" ))
air_reg <- get_reg_string(air_seas)
```

---

get\_seasonal\_ftest\_all

*Generate model based F-test*


---

## Description

Generate model based F-test, changing the model to remove seasonal differences and adding seasonal regressors if necessary. This function is used in the overall seasonal test from Maravall (2012)

## Usage

```
get_seasonal_ftest_all(
  seas_obj = NULL,
  this_series = "b1",
  use_seasonal = TRUE
)
```

## Arguments

seas_obj	seas object for a single series. This is a required entry.
this_series	character string; the table used to generate the model based F-test. Default is "b1".
use_seasonal	logical scalar; if TRUE, the seasonal regressor is used; otherwise, use the sine-cosine trigonometric regressors generated by sincos.

## Details

Version 4.3, 6/21/2024

## Value

a numeric vector with the degrees of freedom, F statistic, and probability generated for the model based seasonal f-test used in the seasonal testing procedure in Maravall(2012)

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
air_seas <-
  seasonal::seas(AirPassengers, arima.model="(0 1 1)(0 1 1)",
    forecast.maxlead = 36, slidingspans = "",
    transform.function = "log", series.save = "a1")
air_ftest_all <-
  get_seasonal_ftest_all(air_seas, this_series = "a1")
```



---

get\_seasonal\_ftest\_prob

*Probability of model based F-test*


---

## Description

Get probability for model based F-test, changing the model to remove seasonal differences and adding seasonal regressors if necessary. This function is used in the overall seasonal test from Maravall (2012)

## Usage

```
get_seasonal_ftest_prob(
  seas_obj = NULL,
  this_series = "b1",
  use_seasonal = TRUE
)
```

## Arguments

seas_obj	seas object for a single series. This is a required entry.
this_series	character string; the table used to generate the model based F-test. Default is "b1".
use_seasonal	logical scalar; if TRUE, the seasonal regressor is used; otherwise, use the sine-cosine trigonometric regressors generated by sincos.

## Details

Version 4.4, 6/21/2024

## Value

test probability generated for the model based seasonal F-test used in the seasonal testing procedure in Maravall(2012)

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
air_seas_seasonal <-
  seasonal::seas(AirPassengers, arima.model="(0 1 1)",
    regression.variables = "seasonal",
    forecast.maxlead = 36, slidingspans = "",
    transform.function = "log", series.save = "a1")
air_ftest_prob <- sautilities::get_seasonal_ftest_prob(air_seas_seasonal)
```

---

get_seasonal_theta	<i>Seasonal Moving Average from Airline Model</i>
--------------------	---

---

### Description

Get the value of a seasonal moving average coefficient estimated from an airline model.

### Usage

```
get_seasonal_theta(
  seas_obj = NULL,
  freq = 12,
  this_index = 1,
  return_string = TRUE,
  significant_digits = 3
)
```

### Arguments

seas_obj	A seas object for a single series generated from the seasonal package. This is a required entry.
freq	A numeric scalar, the frequency of the time series. Default is 12.
this_index	An integer scalar, an index of the vector values to be passed. Acceptable values are 1 (seasonal MA coefficient value), 2 (seasonal MA coefficient standard error), or 3 (t-value of the Seasonal MA coefficient). Default is 1.
return_string	A Logical scalar; indicates whether value returned is a string or numeric. Default is TRUE.
significant_digits	an integer scalar; significant digits to be saved when a string is returned. Default is 3.

### Details

Version 3.0, 5/14/2024

### Value

Character string containing a value related to the seasonal MA coefficient from the regARIMA model fit in the seas object seas\_obj. The standard error or t-value of the seasonal MA coefficient can be returned depending on the value of this\_index. If return\_string is FALSE, this is a numeric.

### Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

### Examples

```
air_seas <- seasonal::seas(AirPassengers, transform.function = "log",
  arima.model = "(0 1 1)(0 1 1)", x11="")
this_seasonal_theta <- get_seasonal_theta(air_seas, return_string = FALSE)
```

---

get_timer	<i>Generate elapsed time of run in milliseconds</i>
-----------	---

---

**Description**

Read profiler information from saved files and generate the elapsed time of an X-13 run in milliseconds.

**Usage**

```
get_timer(this_base = NULL, this_path = NULL)
```

**Arguments**

this_base	Character scalar; Filename of output file of the X-13 run. This is a required entry.
this_path	Character scalar; Path of profiler output. This is an optional entry.

**Details**

Version 1.1, 11/29/2023

**Value**

Numeric object of the elapsed time of the X-13 run.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
## Not run: AE1011330000_time <- get_timer("AE1011330000_auto", "X:/code/census_build_60/basic/")
```

---

get_transform	<i>Get transformation</i>
---------------	---------------------------

---

**Description**

Get transformation from the seas object of a single time series

**Usage**

```
get_transform(seas_obj = NULL)
```

**Arguments**

seas_obj	seas object generated from a call of seas on a single time series This is a required entry.
----------	---

Details

Version 1.10, 5/15/2024

Value

Character string with transformation used to model time series in seas run

Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

Examples

```
air_seas <- seasonal::seas(AirPassengers, arima.model = "(0 1 1)(0 1 1)", x11="")
air_trans <- get_transform(air_seas)
```

---

get_udg_entry	<i>Get entry from UDG file</i>
---------------	--------------------------------

---

Description

Returns a specific element of a list of udg entries.

Usage

```
get_udg_entry(seas_obj = NULL, this_key, this_index = 0, convert = TRUE)
```

Arguments

seas_obj	seas object for a single series
this_key	character scalar; keyword found in UDG output generated by X-13ARIMA-SEATS.
this_index	integer scalar; index of entry in vector to extract. If set to 0 (the default), get the last entry.
convert	logical scalar; if TRUE, convert character to numeric object. Default is TRUE.

Details

Version 2.7 5/14/2024

Value

The this\_index element of the array returned from the UDG entry for this\_key

Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

Examples

```
air_seas_short <- seasonal::seas(AirPassengers, series.span = ',1960.9',
                                arima.model="(0 1 1)(0 1 1)",
                                forecast.maxlead = 36, slidingspans = "",
                                transform.function = "log")
fcst_tstat <- get_udg_entry(air_seas_short, 'forctval01')
```

---

get_udg_index	<i>Index for entry in UDG list</i>
---------------	------------------------------------

---

**Description**

Return index for entry in UDG list

**Usage**

```
get_udg_index(udg_list = NULL, this_key = NULL)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
this_key	Keyword found in udg files generated by X-13ARIMA-SEATS This is a required entry.

**Details**

Version 2.3, 5/25/2023

**Value**

An integer denoting which element in the udg output matches the key provided by the user. If there is no match, the function returns the number 0.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_udg_index_a <- get_udg_index(ukgas_udg, this_key='a')
```

---

get_value_from_udg	<i>Get value from external UDG file</i>
--------------------	---

---

**Description**

parse external udg file and get value for a user supplied key

**Usage**

```

get_value_from_udg(
  this_base = NULL,
  this_path = NULL,
  this_key = NULL,
  return_numeric = TRUE
)

```

**Arguments**

<code>this_base</code>	Character scalar; Filename of output file of the X-13 run. This is a required entry.
<code>this_path</code>	Character scalar; Path of profiler output. This is an optional entry.
<code>this_key</code>	Character scalar; Key from udg file to search for. This is a required entry.
<code>return_numeric</code>	Logical scalar; Value returned is converted to numeric. Default is TRUE, returns value as a number.

**Details**

Version 1.4, 12/12/2023

**Value**

Numeric value associated with `this_key`.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```

## Not run: this_ftest<-get_ftest_from_udg("AE1011330000_auto",
                                           "X:/code/census_build_60/basic/",
                                           "aicc")
## End(Not run)

```

---

get\_window

*Subspan time series*

---

**Description**

Generate subspan of time series

**Usage**

```
get_window(X = NULL, plot_start = NULL, plot_end = NULL)
```

**Arguments**

<code>X</code>	Time Series object. This is a required entry.
<code>plot_start</code>	Integer vector of length 2; Starting date for plot. Default is starting date for the time series.
<code>plot_end</code>	Integer vector of length 2; Starting date for plot. Default is ending date for the time series.

**Details**

Version 2.3, 5/25/2023

**Value**

generate subspan of time series `X` specified by `plot_start` and `plot_end`.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air50 <- get_window(AirPassengers, plot_start = c(1950,1), plot_end = c(1959,12))
```

---

`input_saved_x13_file`    *Import File Saved by X-13ARIMA-SEATS*

---

**Description**

Import data from a file saved by the X-13ARIMA-SEATS program

**Usage**

```
input_saved_x13_file(filename = NULL, pos = 2, ncol = 2)
```

**Arguments**

<code>filename</code>	Character string, filename of a file saved by the X-13ARIMA-SEATS program. This is a required entry.
<code>pos</code>	Integer scalar, column of data to be extracted from filename. Default is 2.
<code>ncol</code>	Integer scalar, number of columns of data that exist within filename. Default is 2.

**Details**

Version 1.2, 5/25/2023

**Value**

A time series array

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
## Not run:
airline.sa <- input_saved_x13_file("airline.d11")

## End(Not run)
```

---

lbq\_fail

*Ljung Box Q Test failure message*


---

**Description**

Tests whether the sample autocorrelation of the residuals from a time series model fails the Ljung-Box Q test.

**Usage**

```
lbq_fail(this_acf = NULL, lbq_lags_fail, p_limit = 0.01)
```

**Arguments**

`this_acf`            Matrix object of the saved acf table. This is a required entry.  
`lbq_lags_fail`       Lags of the ACF to test Default is `c(12, 24)`.  
`p_limit`             • numeric limit for the p-value of the Ljung-Box Q Default is `0.01`.

**Details**

Version 1.5, 9/19/2023

**Value**

Logical object which is TRUE if series fails the Ljung Box Q test, FALSE otherwise

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.save = 'acf', check.maxlag = 12, check.qlimit = 0.01)
ukgas_acf <- ukgas_seas$series$acf
ukgas_lbq_fail <- lbq_fail(ukgas_acf, lbq_lags_fail = c(4, 8))
```



lbq\_fail\_why

*LBQ Test Explanation***Description**

Ljung-Box Q Test Failure Message

**Usage**

```
lbq_fail_why(
  this_acf = NULL,
  lbq_lags_fail = c(12, 24),
  p_limit = 0.01,
  return_both = FALSE
)
```

**Arguments**

this_acf	Matrix object of the saved acf table. This is a required entry.
lbq_lags_fail	Lags of the ACF to test. Default is c(12, 24).
p_limit	• numeric limit for the p-value of the Ljung-Box Q. Default is 0.01.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or just produce a warning. Default is FALSE.

**Details**

Generates text on why the sample autocorrelation of the residuals from a time series model fails the Ljung-Box Q test

Version 1.11, 9/20/2023

**Value**

character object tells why series fails the Ljung-Box Q test, 'pass' otherwise.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.maxlag = 12, check.save = 'acf')
ukgas_acf <- ukgas_seas$series$acf
ukgas_lbq_fail_why <- lbq_fail_why(ukgas_acf, lbq_lags_fail = c(4, 8),
                                  return_both = TRUE)
```

lbq\_test

*Ljung-Box Q ACF test***Description**

Tests whether the residuals from a time series model has acceptable autocorrelation as indicated

**Usage**

```
lbq_test(
  seas_obj = NULL,
  lbq_lags_fail = c(12, 24),
  p_limit = 0.01,
  return_this = "test"
)
```

**Arguments**

seas_obj	Object generated by seas() of the seasonal package. This is a required entry.
lbq_lags_fail	• lags of the ACF to test Default is c(12, 24).
p_limit	• numeric limit for the p-value of the Ljung-Box Q Default is 0.01.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 1.7, 5/3/2024

**Value**

A text string denoting if series passes, fails, or has a warning for residual autocorrelation. If Ljung-Box not found, the seasonal object will be updated with check spec arguments - if this is unsuccessful, return 'none'. If regARIMA model not estimated, return 'none'

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.save = 'acf', check.maxlag = 12, check.qlimit = 0.01)
ukgas_lbq_test <- lbq_test(ukgas_seas, lbq_lags_fail = c(4, 8), return_this = 'both')
```

---

make_diag_df	<i>Generate diagnostic summary data frame</i>
--------------	---

---

## Description

Generates a data frame with seasonal adjustment and modeling diagnostics.

## Usage

```
make_diag_df(
  this_data_names = NULL,
  this_acf_test = NULL,
  this_d11f_test = NULL,
  this_spec_peak_test = NULL,
  this_spec_peak_ori_test = NULL,
  this_qs_test = NULL,
  this_qs_rsd_test = NULL,
  this_qs_seasonal_test = NULL,
  this_model_test = NULL,
  this_sspan_test = NULL,
  this_m7_test = NULL,
  this_q2_test = NULL,
  return_this = "both"
)
```

## Arguments

<code>this_data_names</code>	vector object with names of time series used in seasonal adjustment. This is a required entry.
<code>this_acf_test</code>	list object with results from test of regARIMA residual ACF
<code>this_d11f_test</code>	list object with results from test of D11F
<code>this_spec_peak_test</code>	list object with results from testing for spectral peaks in the seasonally adjusted series
<code>this_spec_peak_ori_test</code>	list object with results from testing for spectral peaks in the original series
<code>this_qs_test</code>	list object with results from QS test
<code>this_qs_rsd_test</code>	list object with results from residual QS test
<code>this_qs_seasonal_test</code>	list object with results from seasonal QS test
<code>this_model_test</code>	list object with results from model diagnostics test
<code>this_sspan_test</code>	list object with results from sliding spans test
<code>this_m7_test</code>	list object with results from M7 test
<code>this_q2_test</code>	list object with results from Q2 test
<code>return_this</code>	Character string; what the function returns - 'why' returns why the test failed or received a warning, 'test' returns test results, or 'both'. Default is 'both'.

**Details**

Version 6.0, 5/21/2024

**Value**

A data frame with X-13 Diagnostics, with the elements not expressed as factors

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
unemp_seasonal_filter <- lapply(unemployment_list, function(x)
  try(optimal_seasonal_filter(x, use_msr = TRUE)))
unemp_seas_list <- seasonal::seas(unemployment_list,
  x11 = "", slidingspans = "",
  arima.model = "(0 1 1)(0 1 1)",
  transform.function = "log",
  forecast.maxlead=60,
  check.print = c( "pacf", "pacfplot" ),
  list = list(
    list(x11.seasonalma = unemp_seasonal_filter$3000013),
    list(x11.seasonalma = unemp_seasonal_filter$3000014),
    list(x11.seasonalma = unemp_seasonal_filter$3000025),
    list(x11.seasonalma = unemp_seasonal_filter$3000026)
  ))
unemp_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas_list)
unemp_acf <- lapply(unemp_seas_update, function(x)
  try(acf_test(x, return_this = 'both'))))
unemp_d11f <- lapply(unemp_seas_update, function(x)
  try(d11f_test(x, p_level = 0.05, return_this = 'both'))))
unemp_spec_peak <- lapply(unemp_seas_update, function(x)
  try(spec_peak_test(x, return_this = 'both'))))
unemp_spec_peak_ori <- lapply(unemp_seas_update, function(x)
  try(spec_peak_test(x, this_spec = "spcori", return_this = 'both'))))
unemp_qs <- lapply(unemp_seas_update, function(x)
  try(qs_test(x, test_full = FALSE, p_limit_fail = 0.01,
    p_limit_warn = 0.05, return_this = 'both'))))
unemp_qs_rsd <- lapply(unemp_seas_update, function(x)
  try(qs_rsd_test(x, test_full = FALSE, p_limit_fail = 0.01,
    p_limit_warn = 0.05, return_this = 'both'))))
unemp_qs_seasonal <- lapply(unemp_seas_update, function(x)
  try(qs_seasonal_test(x, test_full = FALSE,
    p_limit_pass = 0.01, p_limit_warn = 0.05,
    robust_sa = FALSE, return_this = 'both'))))
unemp_model <- lapply(unemp_seas_update, function(x)
  try(model_test(x, return_this = 'both'))))
unemp_sspan <- lapply(unemp_seas_update, function(x)
  try(sspan_test(x, sf_limit = 15, change_limit = 35,
    return_this = 'both'))))
unemp_m7 <- lapply(unemp_seas_update, function(x)
  try(mq_test(x, return_this = 'both'))))
unemp_q2 <- lapply(unemp_seas_update, function(x)
  try(mq_test(x, this_label = 'Q2', return_this = 'both'))))
```

```

unemp_names <- names(unemployment_list)
unemp_diag_df <-
  make_diag_df(unemp_names,
    this_acf_test = unemp_acf,
    this_d11f_test = unemp_d11f,
    this_spec_peak_test = unemp_spec_peak,
    this_spec_peak_ori_test = unemp_spec_peak_ori,
    this_qs_test = unemp_qs,
    this_qs_rsd_test = unemp_qs_rsd,
    this_qs_seasonal_test = unemp_qs_seasonal,
    this_model_test = unemp_model,
    this_sspan_test = unemp_sspan,
    this_m7_test = unemp_m7,
    this_q2_test = unemp_q2)

```

---

match_list	<i>List element match</i>
------------	---------------------------

---

## Description

Returns element of list that matches this\_string.

## Usage

```
match_list(this_list, this_string = "fail")
```

## Arguments

this_list	List of character strings.
this_string	Character string to match against elements of the list, ie, this_string = 'pass'. Default is 'fail'

## Details

Version 3.1, 5/22/2023

## Value

A vector of list element names that match this\_string. If nothing matches, the function will output the string 'none'.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```

unemp_seas <-
  seasonal::seas(unemployment_list, x11 = "",
                 slidingspans = "",
                 transform.function = "log",
                 arima.model = "(0 1 1)(0 1 1)",
                 forecast.maxlead = 60,
                 check.print = c( "pacf", "pacfplot" ))
test_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas)
test_acf_test <- lapply(test_seas_update, function(x)
  try(acf_test(x, return_this = 'test'))))
test_acf_fail <- match_list(test_acf_test, 'fail')
test_acf_warn <- match_list(test_acf_test, 'warn')
test_acf_pass <- match_list(test_acf_test, 'pass')

```

---

match_list_number	<i>Number of list element matches</i>
-------------------	---------------------------------------

---

**Description**

Returns number of elements in list that matches this\_string.

**Usage**

```
match_list_number(this_list, this_string = "fail")
```

**Arguments**

this_list	List of character strings.
this_string	Character string to match against elements of the list, ie, this_string = 'pass'. Default is 'fail'.

**Details**

Version 3.1, 5/21/2023

**Value**

The number of list items that match this\_string.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```

unemp_seas <-
  seasonal::seas(unemployment_list, x11 = "",
    slidingspans = "",
    transform.function = "log",
    arima.model = "(0 1 1)(0 1 1)",
    forecast.maxlead = 60,
    check.print = c( "pacf", "pacfplot" ))
test_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas)
test_acf_test <-
  lapply(test_seas_update, function(x)
    try(acf_test(x, return_this = 'test'))))
test_acf_number_fail <-
  match_list_number(test_acf_test, 'fail')
test_acf_number_warn <-
  match_list_number(test_acf_test, 'warn')
test_acf_number_pass <-
  match_list_number(test_acf_test, 'pass')

```

---

member_of_list	<i>Member of list</i>
----------------	-----------------------

---

**Description**

Determines if a name is a member of a list.

**Usage**

```
member_of_list(this_list = NULL, this_name = NULL)
```

**Arguments**

this_list	A list of objects. This is a required entry.
this_name	character string; element name of this_list. This is a required entry.

**Details**

Version 1.4, 5/22/2023

**Value**

returns TRUE if this\_name is an element of this\_list, FALSE otherwise

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
emp_seas_list <- seasonal::seas(employment_list,
                               slidingspans = "", x11 = "",
                               transform.function = "log",
                               arima.model = "(0 1 1)(0 1 1)",
                               forecast.maxlead=36,
                               check.print = c( "pacf", "pacfplot" ))

emp_seas_update <-
  Filter(function(x) inherits(x, "seas"), emp_seas_list)
if (member_of_list(emp_seas_update, 'n2000014')) {
  ## Not run: save_spec_file(emp_seas_update$n2000014, 'n2000014',
    this_directory      = "X:\\seasonalAdj\\testing\\sautilities",
    this_data_directory = "X:\\seasonalAdj\\cps_dec_2022\\dat",
    data_file_name      = "n2000014.dat")

  ## End(Not run)
}
```

---

model_summary_list	<i>ARIMA model summary from a list</i>
--------------------	--

---

**Description**

Generate a matrix that summarizes ARIMA models from a list of seas objects.

**Usage**

```
model_summary_list(
  seas_obj_list = NULL,
  add_diff = FALSE,
  return_data_frame = FALSE
)
```

**Arguments**

**seas\_obj\_list** list of seas objects generated from a call of seas on a single time series. A required argument.

**add\_diff** logical scalar; add differencing information, if included in model

**return\_data\_frame** logical scalar; if TRUE, return a data frame of the diagnostics, otherwise return a matrix. Default is FALSE.

**Details**

Version 2.1, 5/22/2024

**Value**

matrix of ARMA model orders, nonseasonal and seasonal total parameters for a given set of series

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>



## Examples

```
unemp_seas_list <-
  seasonal::seas(unemployment_list, slidingspans = "",
    transform.function = "log",
    outlier.types = "all",
    arima.model = "(0 1 1)(0 1 1)",
    forecast.maxlead=36, x11 = "",
    check.print = c( "pacf", "pacfplot" ))
unemp_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas_list)
unemp_model_matrix <-
  model_summary_list(unemp_seas_update)
unemp_model_df <-
  model_summary_list(unemp_seas_update, add_diff = TRUE,
    return_data_frame = TRUE)
```

---

model_test	<i>Tests Time Series Model.</i>
------------	---------------------------------

---

## Description

Tests whether the time series model has acceptable diagnostics.

## Usage

```
model_test(
  seas_obj = NULL,
  t_value = 3,
  p_value = 0.05,
  otl_auto_limit = 5,
  otl_all_limit = 5,
  return_this = "test"
)
```

## Arguments

seas_obj	Object generated by seas() of the seasonal package. This is a required entry.
t_value	t-statistic limit for regressors. Default is 3.
p_value	p-value limit for regressors. Default is 0.01.
otl_auto_limit	Numeric object; limit for number of automatically identified outliers. Default is 4.
otl_all_limit	Numeric object; limit for number of outlier regressors. Default is 6.
return_this	character string; what the function returns - 'test' or 'both'. Default is 'both'.

## Details

Version 4.4, 5/14/2024

## Value

A text string denoting if the series passed or failed the tests of ARIMA diagnostics.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_model <- model_test(ukgas_seas, t_value=3.0, p_value=0.01, otl_auto_limit=4,
  otl_all_limit=6)
```

---

model\_test\_why

*Model Test Warning Message*

---

**Description**

Generates text on why a time series model is inadequate.

**Usage**

```
model_test_why(
  udg_list = NULL,
  t_value = 3,
  p_value = 0.05,
  otl_auto_limit = 5,
  otl_all_limit = 5,
  return_both = FALSE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
t_value	Numeric scalar; t-statistic limit for regressors. Default is 3.0
p_value	Numeric scalar; p-value limit for regressors. Default is 0.01
otl_auto_limit	Integer scalar; limit for number of automatically identified outliers. Default is 4
otl_all_limit	Integer scalar; limit for number of automatically identified outliers. Default is 4
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is TRUE.

**Details**

Version 4.2, 5/23/2023

**Value**

A text string denoting why the series passed or failed a series of tests of ARIMA diagnostics. `ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)", x11="", transform.function = "log", forecast.maxlead=20, check.print = c( "pacf", "pacfplot" ))` `ukgas_udg <- seasonal::udg(ukgas_seas)` `ukgas_model_why <- model_test_why(ukgas_udg, t_value=3.0, p_value=0.01, otl_auto_limit=4, otl_all_limit=6, return_both = TRUE)`

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

mq\_test

*Test X-11-ARIMA M and Q statistics***Description**

Generates a test for X-11-ARIMA M and Q statistics.

**Usage**

```
mq_test(
  seas_obj = NULL,
  this_label = "m7",
  this_fail_limit = 1.2,
  this_warn_limit = 0.8,
  return_this = "test"
)
```

**Arguments**

seas_obj	Object generated by seas() of the seasonal package. This is a required entry.
this_label	Character string; label for an M or Q statistic, such as 'M7', 'Q', or 'Q2'. Default is 'm7'.
this_fail_limit	Numeric scalar; value above which the M or Q statistic fails. Default is 1.2.
this_warn_limit	Numeric scalar; value above which the M or Q statistic gives a warning message if it is less than this_fail_limit; default is 0.8
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 3.3, 5/14/2024

**Value**

A text string denoting if series passes or has a warning for residual seasonality. If D11f statistic not found, return 'none'.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
  x11="", transform.function = "log", forecast.maxlead=20,
  check.print = c( "pacf", "pacfplot" ))
ukgas_q <- mq_test(ukgas_seas, this_label = 'q', return_this = 'both')
```

---

norm_test	<i>Normality Tests for Time Series Models.</i>
-----------	--

---

## Description

Tests different normality statistics available in X-13ARIMA-SEATS.

## Usage

```
norm_test(seas_obj = NULL, this_norm = NULL, return_this = "test")
```

## Arguments

seas_obj	Object generated by seas() of the seasonal package. This is a required entry.
this_norm	Type of normality statistic being extracted; permissible values are 'a', 'kurtosis', 'skewness'. This is a required entry.
return_this	Character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

## Details

Version 4.4, 5/14/2024

## Value

A text string denoting whether the series passed or failed the specific normality test. If improper value is specified for this\_norm, return NULL. If no statistic is found, return NA.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11 = "", transform.function = "log", forecast.maxlead = 20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_norm_a <- norm_test(ukgas_seas, 'a')
ukgas_norm_kurtosis <- norm_test(ukgas_seas, 'kurtosis')
ukgas_norm_skewness <- norm_test(ukgas_seas, 'skewness')
```

---

norm_test_why	<i>Normality Test Warning Message</i>
---------------	---------------------------------------

---

## Description

Generates message for why different normality statistics available in X-13ARIMA-SEATS fail.

## Usage

```
norm_test_why(udg_list = NULL, this_norm = NULL, return_both = FALSE)
```

## Arguments

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
this_norm	Character scalar indicating type of normality statistic being extracted; permissible values are 'a', 'kurtosis', 'skewness'. This is a required entry.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

## Details

Version 3.2, October 2, 2020

## Value

A text string showing why a series failed the specific normality test

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_norm_a_why <- norm_test_why(ukgas_udg, 'a', return_both = TRUE)
ukgas_norm_kurtosis_why <- norm_test_why(ukgas_udg, 'kurtosis', return_both = TRUE)
ukgas_norm_skewness_why <- norm_test_why(ukgas_udg, 'skewness', return_both = TRUE)
```

---

NP\_test

*Non-Parametric test from Maravall (2012)*


---

### Description

Non-Parametric test for seasonality based on Kendall and Ord (1990), and originally due to Friedman from a paper by Maravall. This code is adapted from `kendalls` subroutine in `ansub11.f` from the X-13ARIMA-SEATS source code

### Usage

```
NP_test(x = NULL)
```

### Arguments

`x`                      `ts` time series object. This is a required entry.

### Details

Version 1.7, 5/23/2023

### Value

List object with three elements: `ken` (test statistic), `df` (degrees of freedom), `cv` (test probability)

### Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

### Examples

```
NP_test_air <- NP_test(AirPassengers)
```

---

optimal\_seasonal\_filter

*Optimal X-11 seasonal moving average selection*


---

### Description

Determine the optimal X-11 seasonal moving average based on the value of the seasonal moving average coefficient from an airline model.

**Usage**

```

optimal_seasonal_filter(
  this_series = NULL,
  aictest = NULL,
  model = "(0 1 1)(0 1 1)",
  variables = NULL,
  outlier = TRUE,
  trans = NULL,
  missing_code = NULL,
  this_xreg = NULL,
  dp_limits = TRUE,
  use_msr = FALSE,
  use_3x15 = TRUE
)

```

**Arguments**

<code>this_series</code>	A time series object. This is a required entry.
<code>aictest</code>	a character string with the entries for the regression.aictest argument to the seas function from the seasonal package. Default is NULL, AIC testing not done.
<code>model</code>	a character string with the entry for the arima.model argument to the seas function from the seasonal package. Default is "(0 1 1)(0 1 1)". Model should have a (0 1 1) seasonal term.
<code>variables</code>	a character string with the entries for the regression.variables argument to the seas function from the seasonal package. Default is NULL, no regressors added.
<code>outlier</code>	logical scalar, if TRUE outlier identification is done in the call to the seas function from the seasonal package. Default is TRUE.
<code>trans</code>	character scalar, a character string with the entry for the transform.function argument to the seas function. Default is NULL, and the entry auto will be used.
<code>missing_code</code>	numeric scalar, a number with the entry for the series.missingcode argument to the seas function. Default is NULL, no missing value code is used.
<code>this_xreg</code>	numeric matrix, a user defined regressor matrix to be used in the model estimation. Default is NULL, no user-defined regressors are used.
<code>dp_limits</code>	logical scalar, if TRUE limits from Deputot and Planas will be used to choose the moving average, else limits from Bell Chow and Chu will be used. Default is TRUE.
<code>use_msr</code>	logical scalar, if TRUE result of MSR selection will be used if model cannot be estimated, otherwise function will return a NULL value. Default is FALSE.
<code>use_3x15</code>	logical scalar, if TRUE 3x15 seasonal filter will be returned if chosen, otherwise function will return a 3x9 value. Default is TRUE.

**Details**

Version 4.3, 5/25/2023

**Value**

The optimal X-11 seasonal filter, unless the airline model cannot be estimated.

Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

Examples

```
this_seasonal <-
  optimal_seasonal_filter(shoes2008, aictest = c("td", "easter"), use_msr = TRUE)
this_seasonal2 <-
  optimal_seasonal_filter(shoes2008, aictest = c("td", "easter"), dp_limits = FALSE,
    use_msr = TRUE)
```

---

overall\_seasonal\_test\_1  
*First overall sasonality test from Maravall (2012)*

---

Description

Conduct the first overall test for seasonality as laid out in Maravall (2012)

Usage

```
overall_seasonal_test_1(
  seas_obj = NULL,
  this_series = "a1",
  take_log = TRUE,
  this_ori_qs = "qsori"
)
```

Arguments

seas_obj	seas object for a single series This argument is required.
this_series	character string; the table used to generate the AR(30) spectrum. Default is "a1".
take_log	logical scalar; indicates if the AR spectrum is generated from the log of the data. Default is TRUE.
this_ori_qs	character string; code for which original series QS will be used in this analysis. Default is "qsori" (original series, full span); other choices are "qssorievadj" (original series adjusted for extreme values,short span), "qsorievadj" (original series adjusted for extreme values, full span), and "qssori" (original series, short span)

Details

Version 3.4, 5/21/2024

Value

A list with 3 elements: QStest (test probability for QS), NPtest (test probability for NP), and result (character string with test result - possible values of either "evidence of seasonality" and "no evidence of seasonality")



**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers,
                           arima.model="(0 1 1)(0 1 1)",
                           forecast.maxlead = 36, slidingspans = "",
                           transform.function = "log",
                           series.save = "a1")
first_test <- overall_seasonal_test_1(air_seas)
```

---

overall\_seasonal\_test\_2

*Second overall sasonality test from Maravall (2012)*

---

**Description**

Conduct the second overall test for seasonality as laid out in Maravall (2012)

**Usage**

```
overall_seasonal_test_2(
  seas_obj = NULL,
  this_ar_spec_cv = NULL,
  this_series = "b1",
  this_ori_qs = "qssorievadj",
  take_log = TRUE,
  take_diff = TRUE,
  use_seasonal = TRUE
)
```

**Arguments**

seas_obj	seas object generated by the seasonal package. This is a required entry.
this_ar_spec_cv	List object with two elements - 99 and 95 percent critical values for the frequencies of the AR(30) spectrum as generated by the gen_ar_spec_cv function.
this_series	character string; the table used to generate the AR(30) spectrum. Default is "b1".
this_ori_qs	character string; code for which original series QS will be used in this analysis. Default is "qssorievadj" (original series adjusted for extreme values, short span); other choices are "qsori" (original series, full span), "qsorievadj" (original series adjusted for extreme values, full span), and "qssori" (original series, short span)
take_log	logical scalar; indicates if the AR spectrum is generated from the log of the data. Default is TRUE.
take_diff	logical scalar; indicates if the data is differenced before the AR spectrum is generated. Default is TRUE.
use_seasonal	logical scalar; if TRUE, the seasonal regressor is used; otherwise, use the sine-cosine trigonometric regressors generated by sincos.

Details

Version 4.1, 5/14/2024

Value

A list with 5 elements: QStest (test probability for QS), NPtest (test probability for NP), Ftest (test probability for model based seasonal F-test), spectrum (character string with test result - possible values of either "evidence of seasonal peak", "no evidence of seasonal peak"), and result (character string with test result - possible values of either "strong seasonal", "weak seasonal", "no seasonal").

Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

Examples

```
air_seas <- seasonal::seas(AirPassengers,
                           arima.model="(0 1 1)(0 1 1)",
                           series.save = "b1",
                           forecast.maxlead = 36, slidingspans = "",
                           transform.function = "log")
ar30_spec_cv <- gen_ar_spec_cv(1000, 97, 12)
second_test <- overall_seasonal_test_2(air_seas, ar30_spec_cv)
```

---

process_list	<i>Process list object of numbers</i>
--------------	---------------------------------------

---

Description

Process list object of numbers and return names of elements that are either greater than or less than a limit.

Usage

```
process_list(
  this_list = NULL,
  this_limit = NULL,
  abs_value = FALSE,
  greater_than = TRUE
)
```

Arguments

this_list	List of numeric values. The elements should be scalars, not arrays. This is a required entry.
this_limit	Numeric scalar which serves as the limit of the numbers stored in this_list. This is a required entry.
abs_value	Logical scalar that indicates whether the absolute value is taken of the numbers before the comparison is made. (default is FALSE)
greater_than	logical object that specified whether the element names returned are greater than or less than the limit specified in this_limit (default is TRUE)

**Details**

Version 2.2, 5/23/2023

**Value**

A vector of list element names where the value in `this_list` is greater than or less than the limit specified in `this_limit`. If nothing matches, the function will output the string 'none'

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
emp_seas_list <-
  seasonal::seas(employment_data_mts,
    slidingspans = "", forecast.maxlead=36,
    arima.model = "(0 1 1)(0 1 1)",
    transform.function = "log", x11 = "",
    check.print = c( "pacf", "pacfplot" ))
emp_seas_update <-
  Filter(function(x) inherits(x, "seas"), emp_seas_list)
m7_key <- get_mq_key('M7')
emp_m7_list <- lapply(emp_seas_update, function(x)
  try(get_udg_entry(x, m7_key)))
emp_m7_pass <- process_list(emp_m7_list, this_limit = 1.0,
  abs_value = TRUE, greater_than = FALSE)
```

proc\_outlier

*Extract dates from outlier text***Description**

Process name of outlier regressor to extract the dates associated with the outlier.

**Usage**

```
proc_outlier(this_outlier = NULL, this_freq = 12, add_type = TRUE)
```

**Arguments**

<code>this_outlier</code>	Character string; outlier regressor. This is a required entry.
<code>this_freq</code>	integer scalar; time series frequency. Default is 12.
<code>add_type</code>	logical scalar; determines if type of outlier is added to the output. Default is TRUE.

**Details**

Version 2.1, 5/2/2024

**Value**

List of either year and month/quarter of outlier, or year and month/quarter of start and end of outlier

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <-
  seasonal::seas(AirPassengers, x11="", slidingspans = "",
    transform.function = "log", arima.model = "(0 1 1)(0 1 1)",
    regression.aictest = 'td', forecast.maxlead=36,
    check.print = c( "pacf", "pacfplot" ))
this_auto_outlier <- get_auto_outlier_string(air_seas)
this_outlier      <- proc_outlier(this_auto_outlier)
```

---

 qs\_fail\_why

*QS diagnostic failure message*


---

**Description**

generates text explaining why the QS diagnostic failed or generated a warning.

**Usage**

```
qs_fail_why(
  udg_list = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_fail = 0.01,
  robust_sa = TRUE,
  return_both = FALSE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span. Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_fail	Numeric scalar; P-value limit for QS statistic for failure. Default is 0.01.
robust_sa	Logical scalar indicating if SA or irregular series adjusted for extremes is included in testing. Default is TRUE.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

**Details**

Version 4.2, 5/23/2023

**Value**

A text string denoting why the series failed the tests of QS diagnostics.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_qs_test <-
  qs_fail_why(ukgas_udg, test_full = FALSE, p_limit_fail = 0.01, return_both = TRUE)
```

---

 qs\_rsd\_fail\_why

*QS diagnostic for regARIMA residuals failure message*


---

**Description**

Generates text explaining why the QS diagnostic failed or generated a warning for regARIMA residuals.

**Usage**

```
qs_rsd_fail_why(
  udg_list = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_fail = 0.01,
  return_both = FALSE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span. Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_fail	Numeric scalar; P-value limit for QS statistic for warning. Default is 0.01.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

**Details**

Version 4.3, 5/25/2023

**Value**

A text string denoting why the series failed the QS test of regARIMA residuals.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_qs_rsd_fail_why <-
  qs_rsd_fail_why(ukgas_udg, test_full = FALSE, p_limit_fail = 0.005, return_both = TRUE)
```

---

 qs\_rsd\_test

*QS diagnostic test*


---

**Description**

Tests using the QS diagnostic developed by Maravall

**Usage**

```
qs_rsd_test(
  seas_obj = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_fail = 0.01,
  p_limit_warn = 0.05,
  return_this = "test"
)
```

**Arguments**

seas_obj	seas object generated by the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span. Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_fail	Numeric scalar; P-value limit for QS statistic for failure. Default is 0.01.
p_limit_warn	Numeric scalar; P-value limit for QS statistic for warning. Default is 0.05.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 4.4, 5/14/2024

**Value**

A text string denoting if the regarima residuals passed or failed tests for residual seasonality using the QS diagnostics. Can test the entire series or the last 8 years or both.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_qs_test_rsd <- qs_rsd_test(ukgas_seas, test_full = FALSE, p_limit_fail = 0.01,
                                p_limit_warn = 0.05, return_this = 'both')
```

---

qs_rsd_warn_why	<i>Residual QS diagnostic warning message.</i>
-----------------	--

---

**Description**

Generates text explaining why the QS diagnostic failed or generated a warning for regARIMA residuals.

**Usage**

```
qs_rsd_warn_why(
  udg_list = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_warn = 0.05,
  return_both = FALSE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span. Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_warn	Numeric scalar; P-value limit for QS statistic for warning. Default is 0.05.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

**Details**

Version 3.3, 5/23/2023

**Value**

A text string denoting why the series generated a warning message for the QS of regARIMA residuals.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_qs_rsd_warn <-
  qs_rsd_warn_why(ukgas_udg, test_full = FALSE, p_limit_warn = 0.05, return_both = TRUE)
```

---

qs\_seasonal\_fail\_why    *QS Test for original series*

---

**Description**

Tests using the QS diagnostic developed by Maravall to determine if the original series is seasonal

**Usage**

```
qs_seasonal_fail_why(
  udg_list = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_warn = 0.05,
  robust_sa = TRUE,
  return_both = FALSE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_warn	Numeric scalar; P-value limit for QS statistic for warning Default is 0.05.
robust_sa	Logical scalar indicating if original series adjusted for extremes is included in testing. Default is FALSE.
return_both	Logical scalar indicating whether the calling function will return both the

**Details**

Version 4.2, 5/23/2023

**Value**

A text string denoting if the series passed or failed the QS diagnostic.



**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_qs_fail_seasonal <-
  qs_seasonal_fail_why(ukgas_udg, test_full = FALSE,
                      p_limit_warn = 0.05, robust_sa = FALSE, return_both = FALSE)
```

---

qs_seasonal_test	<i>QS seasonal tests</i>
------------------	--------------------------

---

**Description**

Tests using the QS diagnostic developed by Maravall to determine if the original series is seasonal

**Usage**

```
qs_seasonal_test(
  seas_obj = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_pass = 0.01,
  p_limit_warn = 0.05,
  robust_sa = TRUE,
  return_this = "test"
)
```

**Arguments**

seas_obj	seas object generated by the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_pass	Numeric scalar; P-value limit for QS statistic for passing Default is 0.01.
p_limit_warn	Numeric scalar; P-value limit for QS statistic for warning Default is 0.05.
robust_sa	Logical scalar indicating if original series adjusted for extremes is included in testing. Default is TRUE.
return_this	Character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 4.4, 5/14/2024

**Value**

A text string denoting if the series passed or failed tests for seasonality using the QS diagnostics. Can test the entire series or the last 8 years or both.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_qs_test_seasonal <-
  qs_seasonal_test(ukgas_seas, test_full = FALSE, p_limit_pass = 0.01,
    p_limit_warn = 0.05, robust_sa=FALSE, return_this = 'both')
```

---

qs\_seasonal\_warn\_why    *Warning or error messages for QS seasonal diagnostic*

---

**Description**

Tests using the QS diagnostic developed by Maravall to determine if the original series is seasonal

**Usage**

```
qs_seasonal_warn_why(
  udg_list = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_pass = 0.05,
  robust_sa = TRUE,
  return_both = FALSE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_pass	Numeric scalar; P-value limit for QS statistic for passing. Default is 0.05.
robust_sa	Logical scalar indicating if original series adjusted for extremes is included in testing. Default is FALSE.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

**Details**

Version 4.2, 5/23/2023

**Value**

A text string denoting if the series had a warning message from the tests for seasonality using the QS diagnostics. Can test the entire series or the last 8 years or both.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_qs_warn_seasonal <-
  qs_seasonal_warn_why(ukgas_udg, test_full = FALSE, p_limit_pass = 0.025,
    robust_sa=FALSE, return_both = TRUE)
```

---

qs_series	<i>QS diagnostic test on a number of series</i>
-----------	---

---

**Description**

Apply QS Tests to a list of seas objevts

**Usage**

```
qs_series(
  seas_obj_list = NULL,
  this_stat = "qsori",
  less_than = TRUE,
  p_limit = 0.01
)
```

**Arguments**

seas_obj_list	list object of seas object generated by the seasonal package. This is a required entry.
this_stat	Character string that specifies which QS statistic is being tested. Allowable values are 'qsori', 'qsorievadj', 'qsrtd', 'qssadj', 'qssadjevadj', 'qsirr', 'qsirrevadj', 'qssori', 'qssorievadj', 'qssrtd', 'qsssdadj', 'qsssdjevadj', 'qssirr', 'qssirrevadj'. Default is "qsori".
less_than	Logical scalar which indicates if the test is going to be $QS < p\_limit$ (less_than = TRUE) or $QS > p\_limit$ (less_than = FALSE). Default is TRUE.
p_limit	Numeric scalar; P-value limit for QS statistic. Default is 0.01.

## Details

Version 3.3, 5/25/2023

## Value

A vector of list element names that have the given QS statistic either less than or greater than the given P-value limit. If nothing matches, the function will output the string 'none'.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
emp_seas_list <-
  seasonal::seas(employment_list,
    x11 = "", slidingspans = "",
    arima.model = "(0 1 1)(0 1 1)",
    transform.function = "log",
    regression.aictest = NULL,
    forecast.maxlead=60,
    check.print = c( "pacf", "pacfplot" ))
test_seas_update <-
  Filter(function(x) inherits(x, "seas"), emp_seas_list)
test_qs_names <-
  qs_series(test_seas_update, 'qssori', less_than = FALSE, p_limit=0.025)
```

---

qs\_test

*QS Test for residual seasonality*

---

## Description

Tests using the QS diagnostic developed by Maravall on seasonally adjusted series and the irregular component

## Usage

```
qs_test(
  seas_obj = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_fail = 0.01,
  p_limit_warn = 0.05,
  robust_sa = TRUE,
  return_this = "test"
)
```

**Arguments**

seas_obj	seas object generated by the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span. Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_fail	Numeric scalar; P-value limit for QS statistic for failure. Default is 0.01.
p_limit_warn	Numeric scalar; P-value limit for QS statistic for warning. Default is 0.05.
robust_sa	Logical scalar indicating if SA or irregular series adjusted for extremes is included in testing. Default is TRUE.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 4.4, 5/14/2024

**Value**

A text string denoting if the series passed or failed tests for residual seasonality using the QS diagnostics. Can test the entire series or the last 8 years or both.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_qs_test <- qs_test(ukgas_seas, test_full = FALSE, p_limit_fail = 0.01,
  p_limit_warn = 0.05, return_this = 'both')
```

---

 qs\_warn\_why

---

*Warning message for QS Test for residual seasonality*


---

**Description**

Generates text explaining why the QS diagnostic generated a warning.

**Usage**

```
qs_warn_why(
  udg_list = NULL,
  test_full = TRUE,
  test_span = TRUE,
  p_limit_warn = 0.05,
  robust_sa = TRUE,
  return_both = FALSE
)
```

**Arguments**

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
test_full	Logical scalar indicating whether to test the full series span Default is TRUE.
test_span	Logical scalar indicating whether to test the final 8-year span used by the spectrum diagnostic. Default is TRUE.
p_limit_warn	Numeric scalar; P-value limit for QS statistic for warning. Default is 0.05.
robust_sa	Logical scalar indicating if SA or irregular series adjusted for extremes is included in testing. Default is TRUE.
return_both	Logical scalar indicating whether the calling function will return both

**Details**

Version 4.2, 5/24/2023

**Value**

A text string denoting if the series passed or failed the tests of ARIMA diagnostics.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    check.print = c( "pacf", "pacfplot" ))
ukgas_udg <- seasonal::udg(ukgas_seas)
ukgas_qs_test <- qs_warn_why(ukgas_udg, test_full = FALSE, p_limit_warn = 0.025, return_both = TRUE)
```

---

replace_na	<i>Replace NA</i>
------------	-------------------

---

**Description**

Replace NA in a vector with a string or number.

**Usage**

```
replace_na(this_vec = NULL, replace_string = "NA", replace_number = NULL)
```

**Arguments**

this_vec	Vector object. This is a required entry.
replace_string	Character scalar which replaces the NAs in the vector. Default is 'NA'.
replace_number	Number which replaces the NAs in the vector. Default is the NA is replaced by the string in replace_string.

**Details**

Version 2.4, 5/25/2023

**Value**

A vector with all NAs replaced by either a character string or a number.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
sample_vec <- c(rnorm(25), NA, rnorm(24))
sample_vec_missing <- replace_na(sample_vec, replace_string = 'Missing')
sample_vec_missing_number <- replace_na(sample_vec, replace_number = -9999)
```

---

r_terror	<i>TERROR for R</i>
----------	---------------------

---

**Description**

A function that duplicates the functionality of the TERROR software (Caporello and Maravall 2004) that performs quality control on time series based on one step ahead forecasts

**Usage**

```
r_terror(
  this_series = NULL,
  max_lead = 36,
  log_transform = TRUE,
  aictest = NULL,
  terror_lags = 1
)
```

**Arguments**

this_series	Time series array. This is a required entry.
max_lead	Number of forecasts generated by the seas run. Default is 36.
log_transform	logical scalar, if TRUE transform. function will be set to log Default is TRUE.
aictest	a character string with the entries for the regression.aictest argument to the seas function from the seasonal package. Default is NULL.
terror_lags	Integer scalar for number of forecast lags from the end of series we'll collect t-statistics. Must be either 1, 2, or 3.

**Details**

Version 3.9, 5/24/2023

**Value**

t-statistics generated by out of sample forecast error for the last 1 to 3 observation of each series in the list.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_terror <- r_terror(AirPassengers, log_transform = TRUE,
                      aictest = c('td', 'easter'), terror_lags = 3)
```

---

r_terror_list	<i>TERROR for R (applied to a list of series)</i>
---------------	---

---

**Description**

Function that duplicates the functionality of the TERROR software (Caporello and Maravall 2004) that performs quality control on time series based on one step ahead forecasts

**Usage**

```
r_terror_list(
  this_data_list = NULL,
  this_lead = 36,
  this_log = TRUE,
  this_aictest = NULL,
  this_terror_lags = 1
)
```

**Arguments**

- this\_data\_list** List of time series (all series in list should be the same frequency and have the same ending date.)
- this\_lead** Number of forecasts generated by the seas run. Default is 36.
- this\_log** logical scalar, if TRUE transform.function will be set to log in the call to the seas function, otherwise auto will be used. Default is TRUE.
- this\_aictest** a character string with the entries for the regression.aictest argument to the seas function from the seasonal package. Default is NULL.
- this\_terror\_lags** Integer scalar for number of forecast lags from the end of series where t-statistics are collected. Must be either 1, 2, or 3.

**Details**

Version 3.5, 5/22/2023



**Value**

list of t-statistics generated by out of sample forecast error for the last 1 to 3 observation of each series in the list.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
emp_terror <- r_terror_list(employment_list, this_log = FALSE,
                           this_lead = 60, this_terror_lags = 3)
```

---

save_metafile	<i>Generate X-13ARIMA-SEATS metafile</i>
---------------	--

---

**Description**

Generates external metafile for spec files generated from a list of seas objects

**Usage**

```
save_metafile(
  this_seas_list = NULL,
  this_name_vec = NULL,
  metafile_name = NULL,
  this_directory = NULL,
  this_spec_directory = NULL,
  this_output_code = NULL,
  this_output_directory = NULL,
  include_directory = FALSE
)
```

**Arguments**

- |                     |  |
|---------------------|--|
| this_seas_list      | • list of seas objects the metafile will be generated from. This is a required entry.  |
| this_name_vec       | vector of character string; vector of series names from the list of seas objects that will be saved. Default is all elements of the seasonal object list this_seas_list are saved. |
| metafile_name       | • character string; base name of metafile to be generated. If not specified, use name of list input as metafile name. Note - do not specify the ".mta" file extension.             |
| this_directory      | • optional directory where the meta file is stored. If not specified, the metafile will be saved in the current working directory.   |
| this_spec_directory | • optional directory where the spec files are stored. If not specified, the spec files are saved in the current working directory.   |

this\_output\_code

- optional character code added to the end of the names in this\_name\_vec to form the output name. If not specified, the metafile will not have alternate output file name(s).

this\_output\_directory

- optional directory where the output files are stored. If not specified, the output files are saved in the current working directory.

include\_directory

- logical scalar; if TRUE, include directory specified in this\_directory with file name output. Otherwise, output only names in this\_name\_vec. Default is FALSE. Note that the argument this\_directory must also be specified.

## Details

Version 3.11, 9/6/2023

## Value

Generates metafile that can be used directly with the X-13ARIMA-SEATS program.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
unemp_seas_list <- seasonal::seas(unemployment_list,
                                slidingspans = "", x11 = "",
                                arima.model = "(0 1 1)(0 1 1)",
                                transform.function = "log",
                                forecast.maxlead=36,
                                check.print = c( "pacf", "pacfplot" ))
unemp_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas_list)
## Not run: save_metafile(unemp_seas_update, metafile_name = 'unemp',
                        this_directory = 'X:\\seasonalAdj\\testing\\sautilities',
                        this_spec_directory = 'X:\\seasonalAdj\\testing\\spc',
                        this_output_directory = 'X:\\seasonalAdj\\testing\\out',
                        include_directory = TRUE)
## End(Not run)
```

---

save\_seas\_object

*Save seas objects*

---

## Description

Stores seas command to reproduce the seas object seas\_obj into the file file\_name.r.

**Usage**

```

save_seas_object(
  seas_obj = NULL,
  file_name = NULL,
  series_name = NULL,
  data_list = NULL,
  list_element = NULL,
  user_reg = NULL,
  this_window = FALSE,
  this_directory = NULL,
  this_sep = "_",
  print_out = FALSE
)

```

**Arguments**

seas_obj	seasonal object. This is a required entry.
file_name	character string; file name where seas object is stored; default is the name of the seasonal object.
series_name	character string; name of time series object used by the seas object; default is the name of the seasonal object.
data_list	character string; name of the list object that holds data; there is no default.
list_element	character string; name of the list element used as data; default is the name of the seasonal object.
user_reg	character string; name of a time series matrix containing user defined regressors; there is no default. If not set, will set variables related to user defined regressors to NULL in the static version of the seas object.
this_window	logical indicator variable; determines if a span of the original series If FALSE, the entire series will be used in the saved file.
this_directory	character string; optional directory where the spec file is stored.
this_sep	character string; separator between elements of the file name. Default is "_".
print_out	logical indicator variable; determines if an out() function is printed at the end of the script. If FALSE, the out() function is commented out. Default is FALSE.

**Details**

Version 9.5, 5/14/2024

**Value**

stores the seas command to reproduce the seas object seas\_obj into the file file\_name.r - if file\_name is not specified, the name of the seasonal object will be used to form the output file name.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11 = "", transform.function = "log", forecast.maxlead = 20,
    check.print = c( "pacf", "pacfplot" ))
## Not run: save_seas_object(ukgas_seas, file_name = "ukgas_seas", series_name = "ukgas",
  print_out = TRUE)
## End(Not run)
```

---

save_series	<i>Save Series</i>
-------------	--------------------

---

## Description

Save a user-defined regression array or matrix with time series attributes to an external ASCII file in X-13ARIMA-SEATS' datevalue format

## Usage

```
save_series(this_series = NULL, this_file = NULL)
```

## Arguments

this_series	double precision time series array to be saved. This is a required entry.
this_file	character string; name of file time series array to be saved to. This is a required entry.

## Details

Version 1.2, 5/25/2023

## Value

file with user-defined regressors will be produced

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
ukgas_seas <-
  seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
    x11="", transform.function = "log", forecast.maxlead=20,
    slidingspans = "", check.print = c( "pacf", "pacfplot" ))
ukgas_sa <- seasonal::final(ukgas_seas)
## Not run: save_series(ukgas_sa, 'ukgas_sa.txt')
```

---

save_spec_file	<i>Save spec file representation of seas object</i>
----------------	---

---

### Description

Stores the spec file representation of the seas object seas\_obj into the file file\_name.spc.

### Usage

```
save_spec_file(
  seas_obj = NULL,
  file_name = NULL,
  this_directory = NULL,
  this_data_directory = NULL,
  data_file_name = NULL,
  xreg_file_name = NULL,
  this_user_name = NULL,
  this_title = NULL
)
```

### Arguments

seas_obj	seasonal object. This is a required entry.
file_name	character string; file name where seas object is stored; default is the name of the seasonal object
this_directory	character string; optional directory where the spec file is stored.
this_data_directory	character string; optional directory where the data files are stored. Default is no change in file entry in the spec file.
data_file_name	character string; optional external file name where data file is stored. Path should be included with file name if data file is not in working directory; quotes will be added by the routine. Default is no change in file entry in the spec file.
xreg_file_name	character string; optional external file name where user defined regressors are stored. Path should be included with file name if data file is not in working directory; quotes will be added by the routine. Default is no change in file entry in the spec file.
this_user_name	vector of character strings; optional names for the user-defined regressors. Should only appear if xreg_file_name is specified.
this_title	character string; optional custom title; quotes will be added by the routine. Default is no change in title entry in the spec file.

### Details

Version 4.3, 5/14/2024

### Value

stores the spec file representation of the seas object seas\_obj into the file file\_name.spc

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
                             x11="", transform.function = "log", forecast.maxlead=20,
                             check.print = c( "pacf", "pacfplot" ))
## Not run: save_spec_file(ukgas_seas, 'ukgas',
                           data_file_name = "ukgas.dat",
                           this_directory = "X:\\seasonalAdj\\testing\\sautilities",
                           this_title = "Production run for quarterly UK Gas")
## End(Not run)
```

---

save_spec_file_vec	<i>Save List of Seas Objects</i>
--------------------	----------------------------------

---

**Description**

Stores each element of a list of seas object `this_seas_object` into separate files

**Usage**

```
save_spec_file_vec(
  this_seas_object_list = NULL,
  this_name_vec = NULL,
  this_directory = NULL,
  this_data_directory = NULL,
  this_ext = ".dat",
  this_title_list = NULL,
  this_title_base = NULL,
  this_xreg_list = NULL,
  this_user_list = NULL,
  make_metafile = FALSE,
  this_metafile_name = NULL,
  this_meta_directory = NULL,
  this_output_directory = NULL,
  include_directory = FALSE
)
```

**Arguments**

`this_seas_object_list` list of seasonal objects. This is a required entry.

`this_name_vec` vector of character string; vector of series names from the list of seas objects that will be saved. Default is all elements of the seasonal object list `this_seas_object_list` are saved.

`this_directory` character string; optional directory where the spec file is stored.

`this_data_directory` character string; optional directory where the data files are stored. Data files are assumed to have the same names as in `this_name_vec` with the file extension specified in `this_ext`. Default is no change in file entry in the spec file.

<code>this_ext</code>	character string; file extension for data files. Default is ".dat".
<code>this_title_list</code>	list of character strings with the titles for each series. Default is to set title to the series name.
<code>this_title_base</code>	character string; optional base for custom title; series name will be added at the end of the title; quotes will be added by the routine. Default is to set title to the series name.
<code>this_xreg_list</code>	list of character strings with the filenames of user defined regressors or NULL for each series. Default is to not set <code>regression.file</code> for the individual series.
<code>this_user_list</code>	list of vectors of character strings with the names of user defined regressors or NULL for each series. Default is to not set <code>regression.file</code> for the individual series.
<code>make_metafile</code>	logical scalar; if TRUE, generate a makefile for this set of files; do not otherwise. Default is FALSE.
<code>this_metafile_name</code>	<ul style="list-style-type: none"> <li>character string; base name of metafile to be generated. If not specified, use name of list input as metafile name. Note - do not specify the ".mta" file extension.</li> </ul>
<code>this_meta_directory</code>	<ul style="list-style-type: none"> <li>optional directory where the meta file is stored. If not specified, the metafile will be saved in the current working directory.</li> </ul>
<code>this_output_directory</code>	<ul style="list-style-type: none"> <li>optional directory where the output files are stored in the metafile. If not specified, the output files are saved in the current working directory.</li> </ul>
<code>include_directory</code>	<ul style="list-style-type: none"> <li>logical scalar; if TRUE, include directory specified in <code>this_directory</code> with file name output. Otherwise, output only names in <code>this_name_vec</code>. Default is FALSE.</li> </ul>

## Details

Version 6.5, 9/26/2024

## Value

Stores the spec file representation of each element of a list of seas objects into separate files.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
unemp_seas_list <-
  seasonal::seas(unemployment_list, slidingspans = "",
    arima.model = "(0 1 1)(0 1 1)",
    transform.function = "log",
    regression.aictest = NULL,
    forecast.maxlead=36,
    check.print = c( "pacf", "pacfplot" ))
test_seas_update <-
```

```

Filter(function(x) inherits(x, "seas"), unemp_seas_list)
## Not run: save_spec_file_vec(test_seas_update,
                             this_name_vec = c('n3000013', 'n3000014', 'n3000025', 'n3000026'),
                             this_data_directory = 'X:\\seasonalAdj\\testing\\data',
                             this_directory = 'X:\\seasonalAdj\\testing\\sautilities',
                             this_meta_directory = 'X:\\seasonalAdj\\testing\\sautilities',
                             this_title_base = 'Production Run for US Unemployment : ',
                             make_metafile = TRUE, include_directory = TRUE)
## End(Not run)

```

seasonal\_ftest

*Model-based F-Test for Time Series Models.***Description**

Model based test for seasonality based on stable seasonal regressors

**Usage**

```

seasonal_ftest(
  seas_obj = NULL,
  p_limit_fail = 0.01,
  p_limit_warn = 0.05,
  use_seasonal = TRUE,
  return_this = "test"
)

```

**Arguments**

seas_obj	object generated by seas() of the seasonal package. This is a required entry.
p_limit_fail	Numeric scalar; P-value limit for model based seasonal F-statistic for passing. Default is 0.01.
p_limit_warn	Numeric scalar; P-value limit for model based seasonal F-statistic for a warning. Default is 0.05.
use_seasonal	logical scalar; if TRUE, the seasonal regressor is used; otherwise, use the sine-cosine trigonometric regressors generated by sincos.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 5.2, 5/14/2024

**Value**

A text string denoting if the series passed or failed tests for seasonality using the model based F-test diagnostic.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>



**Examples**

```
m_air <-
  seasonal::seas(AirPassengers, transform.function = "log", arima.model = '(0 1 1)',
    regression.variables = c('seasonal', 'td'), x11="")
this_seasonal_ftest <- seasonal_ftest(m_air, return_this = 'both')
```

---

set_critical_value	<i>Set outlier critical value</i>
--------------------	-----------------------------------

---

**Description**

Set outlier critical value using the Ljung algorithm as given in Ljung, G. M. (1993). On outlier detection in time series. Journal of Royal Statistical Society B 55, 559-567.

**Usage**

```
set_critical_value(number_observations = NULL, cv_alpha = 0.01)
```

**Arguments**

number_observations	number of observations tested for outliers This is a required entry.
cv_alpha	alpha for critical value

**Details**

Version 1.6 5/25/2023

**Value**

outlier critical value generated by the algorithm given in Ljung (1993). The critical value in X-13 is different as it is adjusted to allow for smaller values to approximate the normal distribution.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
this_critical_value <- set_critical_value(12, 0.025)
```

---

set_legend_position	<i>generate position of plot legend</i>
---------------------	---

---

## Description

Generate position code for the legend command based on the series being plotted.

## Usage

```
set_legend_position(
  data_matrix = NULL,
  this_plot_start = NULL,
  this_plot_freq = 12,
  time_disp = 3,
  value_disp = 1/6,
  default_code = "top"
)
```

## Arguments

data_matrix	numeric matrix; matrix where all series being plotted are stored as columns. This is a required entry.
this_plot_start	Integer scalar; start date of the plot. This is a required entry.
this_plot_freq	Integer scalar; Frequency of time series plotted. Default is 12.
time_disp	Integer scalar; number of observations on the x-axis taken up by the legend. Default is 3.
value_disp	Numeric scalar; factor representing the percentage of the y axis taken up by the legend. Default is 1/6.
default_code	Character string; default position code if the corners are not available. Default is "top". Possible values are "bottomright", "bottom", "bottomleft", "left", "topleft", "topright", "top", "right" and "center".

## Details

Version 2.8, 5/25/2023

## Value

Position codes for the legend command. Possible values are "bottomright", "bottom", "bottomleft", "topleft", "topright" and the value of default\_code.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```

shoes_seas <-
  seasonal::seas(shoes2007, slidingspans = "", transform.function = "log", x11 = "",
    forecast.maxlead=36, check.print = c( "pacf", "pacfplot" ))
this_series <- shoes2007
this_sa      <- seasonal::final(shoes_seas)
this_legend_position <-
  set_legend_position(cbind(this_series, this_sa), start(this_series),
    this_plot_freq = 4, time_disp = 8, value_disp = 1/8,
    default_code = "top")

```

shoes2007

*Retail sales of shoes, 2007***Description**

A time series object

**Usage**

```
shoes2007
```

**Format**

Retail sales of shoes ending in December of 2007

shoes2008

*Retail sales of shoes, 2008***Description**

A time series object

**Usage**

```
shoes2008
```

**Format**

Retail sales of shoes ending in April of 2008

---

spec_peak_fail_why	<i>Failure text for spectral peaks</i>
--------------------	--

---

## Description

generate text on why spectral peaks are flagged

## Usage

```
spec_peak_fail_why(
  udg_list = NULL,
  peak_level = 6,
  this_spec = "spcsa",
  return_both = FALSE
)
```

## Arguments

udg_list	• list object generated by udg() function of the seasonal package. This is a required entry.
peak_level	Integer scalar - limit to determine if a frequency has a spectral peak.
this_spec	text string with the spectrum being tested allowable entries are 'spcori', 'spcsa', 'spcirr', 'spcrsd'. Default is 'spcori'.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

## Details

Version 3.1, 5/24/2023

## Value

A text string denoting if the series passed the tests of spectrum diagnostics, or why the series did not pass. Note that for 'spcori', the series fails

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
air_seas <- seasonal::seas(AirPassengers, transform.function = "log",
  arima.model = "(0 1 1)(0 1 1)", x11 = "")
air_seas_udg <- seasonal::udg(air_seas)
this_spec_peak_fail_why <-
  spec_peak_fail_why(air_seas_udg, this_spec = 'spcori', return_both = TRUE)
```

---

spec_peak_test	<i>Test for spectral peaks</i>
----------------	--------------------------------

---

**Description**

Test if spectral peaks are flagged.

**Usage**

```
spec_peak_test(
  seas_obj = NULL,
  peak_level = 6,
  peak_warn = 3,
  this_spec = "spcsa",
  return_this = "test"
)
```

**Arguments**

seas_obj	object generated by seas() of the seasonal package. This is a required entry.
peak_level	Integer scalar - limit to determine if a frequency has a spectral peak. Default is 6.
peak_warn	Integer scalar - limit to produce a warning that a frequency may have a spectral peak. Default is 3.
this_spec	text string with the spectrum being tested. Allowable entries are 'spcori', 'spcsa', 'spcirr', 'spcrsd'. Default is 'spcori'.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 4.0, 05/3/2024

**Value**

A text string denoting if the series passed or failed the tests of spectrum diagnostics. Note that for spcori, the series fails if none of the frequencies tested had peaks.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
air_seas <- seasonal::seas(AirPassengers, transform.function = "log",
  arima.model = "(0 1 1)(0 1 1)", x11 = "")
this_spec_peak_test <- spec_peak_test(air_seas, this_spec = 'spcori', return_this = 'both')
```

---

spec_peak_warn_why	<i>Warning message for spectral peaks</i>
--------------------	---

---

## Description

Generate warning message related to spectral peaks for a given X-13ARIMA-SEATS spectrum.

## Usage

```
spec_peak_warn_why(
  udg_list = NULL,
  peak_warn_level = 3,
  this_spec = "spcsa",
  return_both = FALSE
)
```

## Arguments

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
peak_warn_level	Integer scalar - limit to produce a warning that a frequency may have a spectral peak. Default is 3.
this_spec	text string with the spectrum being tested. Allowable entries are 'spcori', 'spcsa', 'spcirr', 'spcrsd'. Default is 'spcori'.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is FALSE.

## Details

Version 3.2, 5/24/2023

## Value

A text string denoting if the series passed the tests of spectrum diagnostics, or why the series did not pass. Note that for spcori, the series fails if none of the frequencies tested had peaks

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
air_seas <-
  seasonal::seas(AirPassengers, transform.function = "log",
    arima.model = "(0 1 1)(0 1 1)", x11 = "")
air_seas_udg <- seasonal::udg(air_seas)
this_spec_peak_warn_why <-
  spec_peak_warn_why(air_seas_udg, this_spec = 'spcori', return_both = TRUE)
```

---

sspan\_test

*Sliding Spans Diagnostic*


---

**Description**

Results from using the sliding spans diagnostic.

**Usage**

```
sspan_test(
  seas_obj = NULL,
  sf_limit = 25,
  change_limit = 40,
  additivesa = FALSE,
  return_this = "test"
)
```

**Arguments**

seas_obj	object generated by seas() of the seasonal package. This is a required entry.
sf_limit	Numeric object; limit for the percentage of seasonal spans flagged. Default is 25.
change_limit	Numeric object; limit for the percentage of month-to-month changes flagged. Default is 40.
additivesa	logical scalar; if true, the adjustment is assumed to be additive; default is FALSE.
return_this	character string; what the function returns - 'test' returns test results, 'why' returns why the test failed or received a warning, or 'both'. Default is 'test'.

**Details**

Version 3.8, 5/14/2024

**Value**

A text string denoting if the series passed or failed the tests of sliding spans diagnostics.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
  x11="", transform.function = "log", forecast.maxlead=20,
  slidingspans = "", check.print = c( "pacf", "pacfplot" ))
ukgas_sspan_test <-
  sspan_test(ukgas_seas, sf_limit = 15, change_limit = 35, return_this = 'both')
```

---

sspan\_test\_why

*Sliding Spans Diagnostic Warning Messages*


---

## Description

Generate text on why tests using the sliding spans diagnostic fail.

## Usage

```
sspan_test_why(
  udg_list = NULL,
  sf_limit = 25,
  change_limit = 40,
  additivesa = FALSE,
  return_both = FALSE
)
```

## Arguments

udg_list	List object generated by udg() function of the seasonal package. This is a required entry.
sf_limit	Numeric object; limit for the percentage of seasonal spans flagged. Default is 25.
change_limit	Numeric object; limit for the percentage of month-to-month changes flagged. Default is 40.
additivesa	logical scalar; if true, the adjustment is assumed to be additive; default is FALSE.
return_both	Logical scalar indicating whether the calling function will return both the test results and why the test failed or produced a warning. Default is TRUE.

## Details

Version 4.2, 5/24/2023

## Value

A text string denoting if the series passed the tests of sliding spans diagnostics diagnostics, or why the series failed.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
ukgas_seas <- seasonal::seas(UKgas, series.period = 4, arima.model = "(0 1 1)(0 1 1)",
  x11="", transform.function = "log", forecast.maxlead=20,
  check.print = c( "pacf", "pacfplot" ))
ukgas_seas_udg <- seasonal::udg(ukgas_seas)
ukgas_sspan_test_why <-
  sspan_test_why(ukgas_seas_udg, sf_limit = 15, change_limit = 35, return_both = TRUE)
```



---

static_with_outlier	<i>Add outliers to seas object</i>
---------------------	------------------------------------

---

## Description

Add arguments from the outlier spec to a seas object.

## Usage

```
static_with_outlier(
  seas_obj = NULL,
  new_data = NULL,
  outlier_span = ", ",
  outlier_types = "ao,ls"
)
```

## Arguments

seas_obj	seasonal object. This is a required entry.
new_data	time series object; updated data set from the data used to generate seas_obj. This is a required entry.
outlier_span	character string; sets the argument outlier.span. Default is ", ".
outlier_types	character string; sets the argument outlier.types. Default is "ao,ls").

## Details

Version 2.9, 5/14/2024

## Value

An updated static seas object with outlier arguments included.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
shoes_seas <-
  seasonal::seas(shoes2007, slidingspans = "", transform.function = "log", x11 = "",
    forecast.maxlead = 60)
shoes_seas_outlier <-
  static_with_outlier(shoes_seas, shoes2008, outlier_types = 'all')
```

---

```
static_with_outlier_list
```

*Add outliers to list of seas object*

---

## Description

Add outlier arguments to each element of a list of seas objects .

## Usage

```
static_with_outlier_list(
  seas_obj_list = NULL,
  new_data_list = NULL,
  outlier_span = "",
  outlier_types = "ao,ls"
)
```

## Arguments

`seas_obj_list` list of seasonal objects. This is a required entry.

`new_data_list` list of time series objects; updated data sets from the data used to generate `seas_obj_list`. This is a required entry.

`outlier_span` character string; sets the argument `outlier.span`. Default is `"", ""`.

`outlier_types` character string; sets the argument `outlier.types`. Default is `"ao,ls"`.

## Details

Version 3.4, 5/25/2023

## Value

A list of updated static seas object with outlier arguments included.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
xt_seas_old <-
  seasonal::seas(xt_data_old, slidingspans = "",
    transform.function = "log",
    x11 = "", forecast.maxlead = 60)
xt_outlier_seas <-
  static_with_outlier_list(xt_seas_old, xt_data_new)
```

---

udg_series	<i>Process a list of seas elements</i>
------------	--

---

## Description

Process a list of seas elements to find the elements that are greater than or less than a particular limit for a diagnostic.

## Usage

```
udg_series(
  seas_obj_list = NULL,
  this_key = "autoout",
  this_limit = 5,
  this_abs = FALSE,
  greater_than = TRUE
)
```

## Arguments

- |               |  |
|---------------|--|
| seas_obj_list | • list of seas objects generated by the seasonal package. This is a required entry.  |
| this_key      | • character string containing keyword of the udg function that returns a numeric value. Default is 'autoout'.  |
| this_limit    | • numeric object which serves as the limit of the diagnostic referred to in this_key. Default is '5'   |
| this_abs      | Logical scalar that indicates whether the absolute value is taken of the numbers before the comparison is made. (default is FALSE)                   |
| greater_than  | • logical object that specified whether the element names returned are greater than or less than the limit specified in this_limit. Default is TRUE. |

## Details

Version 3.3, 5/24/2023

## Value

A vector of list element names where this\_key is greater than or less than the limit specified in this\_limit. If nothing matches, the function will output the string 'none'.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
emp_seas_list <- seasonal::seas(employment_data_mts,
  slidingspans = "", transform.function = "log",
  x11 = "", arima.model = "(0 1 1)(0 1 1)",
  forecast.maxlead=36, check.print = c( "pacf", "pacfplot" ))

emp_seas_update <-
```

```

      Filter(function(x) inherits(x, "seas"), emp_seas_list)
xt_bad_m7 <-
  udg_series(emp_seas_update, this_key = 'f3.m07', this_limit = 1.2)
xt_bad_q2 <-
  udg_series(emp_seas_update, this_key = 'f3.qm2', this_limit = 1.2)

```

---

unemployment\_data\_mts    *US Unemployment Series, four main components in an mts object*

---

### Description

#' An mts object of the four main components of US Unemployment expressed as time series objects that end in December, 2022

### Usage

```
unemployment_data_mts
```

### Format

An mts object with 4 time series elements in four columns:

**n3000013** Unemployed Males 16-19

**n3000014** Unemployed Females 16-19

**n3000025** Unemployed Males 20+

**n3000026** Unemployed Females 20+

---

unemployment\_list        *US Unemployment Series, four main components in a list object*

---

### Description

#' A list object of the four main components of US Unemployment expressed as time series objects that end in December, 2022

### Usage

```
unemployment_list
```

### Format

A list object with 4 time series elements:

**n3000013** Unemployed Males 16-19

**n3000014** Unemployed Females 16-19

**n3000025** Unemployed Males 20+

**n3000026** Unemployed Females 20+

---

update_diag_matrix	<i>Update Diagnostic Matrix</i>
--------------------	---------------------------------

---

## Description

Update the matrix of diagnostics used to generate the diagnostic data frame in make\_diag\_df.

## Usage

```
update_diag_matrix(
  this_diag_list = NULL,
  this_test_list = NULL,
  this_label = NULL
)
```

## Arguments

**this\_diag\_list** list object with elements for seasonal adjustment or modeling diagnostic, titles, and the number of columns. This is a required entry.

**this\_test\_list** list object of a specific seasonal adjustment or modeling diagnostic. This is a required entry.

**this\_label** character string; name of diagnostic in this\_test\_list. This is a required entry.

## Details

Version 4.3, 5/24/2023

## Value

list object with updated elements for seasonal adjustment or modeling diagnostic, titles, and the number of columns.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```
unemp_seas_list <- seasonal::seas(unemployment_list,
  x11 = "", slidingspans = "",
  arima.model = "(0 1 1)(0 1 1)",
  transform.function = "log",
  regression.aictest = NULL,
  forecast.maxlead=60,
  check.print = c( "pacf", "pacfplot" ))
test_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas_list)
test_acf <- lapply(test_seas_update, function(x) try(acf_test(x, return_this = 'both'))))
test_names <- names(xt_data_new)
num_names <- length(test_names)
all_diag_list <- list(n = 0, diag = 0, titles = 0)
```

```

if (!is.null(test_acf)) {
  if (length(test_acf) < num_names) {
    this_acf_test <- fix_diag_list(test_acf, test_names, return_this = 'both')
  }
  all_diag_list <-
    update_diag_matrix(all_diag_list, test_acf, "ACF")
}

```

---

update\_vector

*Update vector.*


---

## Description

Fill unspecified elements of a vector with the first element of the input series.

## Usage

```
update_vector(this_series = NULL, this_num = NULL)
```

## Arguments

<code>this_series</code>	Original time series. This is a required entry.
<code>this_num</code>	Length of updated series. Must be more than the length of <code>this_series</code> . This is a required entry.

## Details

Version 2.3, 5/25/2023

## Value

An updated vector of length `this_num` augmented with the first value of the input series.

## Author(s)

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

## Examples

```

this_vector <- c(1,2)
updated_vector <- update_vector(this_vector, 4)

```

---

which_error	<i>Check list for try errors</i>
-------------	----------------------------------

---

**Description**

Checks list for try errors, returning element names with errors

**Usage**

```
which_error(this_list = NULL)
```

**Arguments**

this\_list        list object which potentially contains 'try-error' class objects.

**Details**

Version 2.9, 5/4/2024

**Value**

vector of the names of list elements that are 'try-error' class objects. If the list contains no 'try-error' class objects, the function will return NULL.

**Author(s)**

Brian C. Monsell, <monsell.brian@bls.gov> or <bcmonsell@gmail.com>

**Examples**

```
unemp_seas_list <-
  seasonal::seas(unemployment_list, slidingspans = "",
    transform.function = "log", forecast.maxlead = 36,
    arima.model = "(0 1 1)(0 1 1)",
    check.print = c( "pacf", "pacfplot" ))
unemp_seas_update <-
  Filter(function(x) inherits(x, "seas"), unemp_seas_list)
unemp_seas_errors <- which_error(unemp_seas_update)
```

---

xt_data_list	<i>US Building Permits</i>
--------------	----------------------------

---

**Description**

A list object with 12 components of US Building Permits expressed as time series objects

**Usage**

```
xt_data_list
```

**Format**

A list object with 12 time series elements:

**mw1u** Midwest one family building permits

**mwto** Midwest total building permits

**ne1u** Northeast one family building permits

**neto** Northeast total building permits

**so1u** South one family building permits

**soto** South total building permits

**we1u** West one family building permits

**weto** West total building permits

**us1u** US one family building permits

**us24** US 2-4 family building permits

**us5p** US 5+ family building permits

**usto** US total family building permits

---

xt\_data\_new

*US Building Permits, One Family Buildings (new)*

---

**Description**

A list object of US One family Building Permits for four regions expressed as time series objects that end in October, 2006

**Usage**

xt\_data\_new

**Format**

A list object with 4 time series elements:

**mw1u** Midwest one family building permits

**ne1u** Northeast one family building permits

**so1u** South one family building permits

**we1u** West one family building permits



---

xt\_data\_old*US Building Permits, One Family Buildings (old)*

---

**Description**

A list object of US One family Building Permits for four regions expressed as time series objects that end in December, 2005

**Usage**

```
xt_data_old
```

**Format**

A list object with 4 time series elements:

**mw1u** Midwest one family building permits

**ne1u** Northeast one family building permits

**so1u** South one family building permits

**we1u** West one family building permits

# Index

## \* datasets

- employment\_data\_mts, 21
- employment\_list, 21
- shoes2007, 91
- shoes2008, 91
- unemployment\_data\_mts, 100
- unemployment\_list, 100
- xt\_data\_list, 103
- xt\_data\_new, 104
- xt\_data\_old, 105

absmax, 4

absolute\_pct\_diff, 4

acf\_fail, 5

acf\_fail\_why, 6

acf\_test, 7

acf\_warn, 8

acf\_warn\_why, 9

all\_model\_diag, 10

all\_model\_diag\_list, 12

check\_stats, 14

choose\_optimal\_seasonal\_filter, 16

combined\_spectrum\_test, 17

compare\_dates, 18

convert\_date\_string\_to\_date, 18

d11f\_test, 19

d11f\_test\_why, 20

employment\_data\_mts, 21

employment\_list, 21

fix\_diag\_list, 22

gen\_ao\_outlier\_ts, 23

gen\_ar\_spec\_cv, 24

gen\_hybrid\_sa, 24

gen\_ls\_outlier\_ts, 25

gen\_tc\_outlier\_ts, 26

gen\_x13\_table\_list, 27

get\_acf, 28

get\_arima\_estimates\_matrix, 29

get\_auto\_outlier\_string, 30

get\_fcst\_tval, 30

get\_ftest\_from\_udg, 31

get\_model\_ftest, 32

get\_month\_index, 33

get\_mq\_key, 33

get\_mq\_label, 34

get\_nonseasonal\_theta, 35

get\_norm\_stat, 36

get\_outlier\_list, 36

get\_reg\_string, 39

get\_regarima\_estimates\_matrix, 37

get\_regression\_estimates\_matrix, 38

get\_seasonal\_ftest\_all, 40

get\_seasonal\_ftest\_prob, 41

get\_seasonal\_theta, 42

get\_timer, 43

get\_transform, 43

get\_udg\_entry, 44

get\_udg\_index, 45

get\_value\_from\_udg, 45

get\_window, 46

input\_saved\_x13\_file, 47

lbq\_fail, 48

lbq\_fail\_why, 49

lbq\_test, 50

make\_diag\_df, 51

match\_list, 53

match\_list\_number, 54

member\_of\_list, 55

model\_summary\_list, 56

model\_test, 57

model\_test\_why, 58

mq\_test, 59

norm\_test, 60

norm\_test\_why, 61

NP\_test, 62

optimal\_seasonal\_filter, 62

overall\_seasonal\_test\_1, 64

overall\_seasonal\_test\_2, 65

proc\_outlier, 67

process\_list, [66](#)

qs\_fail\_why, [68](#)  
qs\_rsd\_fail\_why, [69](#)  
qs\_rsd\_test, [70](#)  
qs\_rsd\_warn\_why, [71](#)  
qs\_seasonal\_fail\_why, [72](#)  
qs\_seasonal\_test, [73](#)  
qs\_seasonal\_warn\_why, [74](#)  
qs\_series, [75](#)  
qs\_test, [76](#)  
qs\_warn\_why, [77](#)

r\_terror, [79](#)  
r\_terror\_list, [80](#)  
replace\_na, [78](#)

save\_metafile, [81](#)  
save\_seas\_object, [82](#)  
save\_series, [84](#)  
save\_spec\_file, [85](#)  
save\_spec\_file\_vec, [86](#)  
seasonal\_ftest, [88](#)  
set\_critical\_value, [89](#)  
set\_legend\_position, [90](#)  
shoes2007, [91](#)  
shoes2008, [91](#)  
spec\_peak\_fail\_why, [92](#)  
spec\_peak\_test, [93](#)  
spec\_peak\_warn\_why, [94](#)  
sspan\_test, [95](#)  
sspan\_test\_why, [96](#)  
static\_with\_outlier, [97](#)  
static\_with\_outlier\_list, [98](#)

udg\_series, [99](#)  
unemployment\_data\_mts, [100](#)  
unemployment\_list, [100](#)  
update\_diag\_matrix, [101](#)  
update\_vector, [102](#)

which\_error, [103](#)

xt\_data\_list, [103](#)  
xt\_data\_new, [104](#)  
xt\_data\_old, [105](#)