Naval Center for Cost Analysis

NCCA Inflation Calculator Documentation and Update Instructions

DRAFT

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Naval Center for Cost Analysis (NCCA)
Inflation Calculator Update Instructions

I. Background

A. Mission

This inflation tool supports NCCA's mission to support and guide Navy cost analysis. It supports preparation of cost estimates, budget estimates, analysis of alternatives, economic analysis, and preparation of Selected Acquisition Reports.

B. Inflation Tool Description

There are three files comprising NCCA's inflation tool:

1. **Inflation Calculator (Excel)** – Product for the user community.
2. **Inflation Update File (Excel)** – An update file for use by the database administrator that receives the input rates and generates tables that are transferred to the Inflation Calculator file
3. **Documentation and Update Instructions (Word, this file)** – Contains instructions and appendices for use by both the administrator and users

The Inflation Calculator is an Excel workbook that allows users to escalate and de-escalate costs. The user chooses a cost or appropriation and an inflation base year, and the calculator then generates inflation index tables and performs some specialized functions. The files are unclassified and not sensitive, and are placed on the NCCA web site for downloading.

The user must enable the use of macros on his computer since the Calculator includes several macros and look-up functions. The Calculator has several hidden sheets that are of interest mainly to experienced users.

C. Summary of Update Procedures

The Inflation Calculator is updated at least twice annually. Most sheets are protected, and will require un-protection in order to update. The Excel files are documented with internal instructions and comments not fully described here. These procedures cover the annual, routine updates of inflation and outlay rates and SAR program parameters. They do not cover special updates or enhancements such as adding a new appropriation.

The new inflation and outlay rates obtained from OSD guidance are put in the Inflation Update File, which generates tables that are transferred to the Inflation Calculator. (Contacts for update input are in Appendix 1.) [Note problem if OSD rates are late]

Steps in the update process are summarized below, then described in more detail on the following pages:

Obtain current inflation source documents (OMB/OSD rates) – discussion of data sources.
Update rates in the Inflation Update File -- updating inflation rates and outlay profiles

Update the Inflation Calculator -- primarily by copying values from several workbook tabs in the Inflation Update File into the Calculator File)
Send the Inflation Calculator to NAVSEA and NAVAIR -- for review and concurrence.
Put the Inflation Calculator files on the NCCA web site
Update the documentation

II. Obtain Current Inflation Source Documents (OMB/OSD Rates)

A. OSD Rate Guidance:

OSD provides inflation guidance annually, usually in late January, by memorandum from USD (Comptroller), Subject: Inflation Guidance. However, in the past, OSD has provided this memo as much as months late. The memo can be obtained from Ms. Marie Curtain, OSD Comptroller staff. An attachment to this memo contains "Price Escalation Indices" or inflation rates for the FYDP and two prior years, for 8 non-pay cost elements and 3 pay elements. The rates given for the final year of the FYDP are to be used for all subsequent years.

In the "Price Escalation Indices" page of the OSD Attachment, NCCA methods utilize the rates in the "Outlays" section, not the "Budget Authority" section. NCCA uses the Procurement (purchases) and O&M Fuel rates. From the separate Pay Raise Assumptions section, NCCA uses the Military and Civilian pay escalation rates.

The OSD memo also has attachments with outlay profiles for all appropriations. These will be required to update annual outlay spend-out patterns in the Inflation Calculator File.

B. An Alternate Source for Rates:

ASN(FM&C), FMB also issues annual inflation guidance in January in Budget Guidance (BG) Memorandum BG 04-3A. This is an alternative, partial source for rates, particularly if the OSD guidance is late.

> *Page 1 of FMB's Enclosure 4* of the BG memo restates the OSD annual inflation rates for four cost elements: Fuel, Other (all purchases), Military pay and Civilian pay. This BG memo can be obtained electronically from the web page http://dbweb.secnav.navy.mil/ **https://dbweb.secnav.navy.mil/GUIDANCE/NOTES/BG04/BG04_3.htm** (DBWEB account is required), or from Ms. Judy Parker or her staff. FMB may use different equations that result in rates and indices that are similar to, but slightly different, than those of NCCA.
>
> *Page 2 of FMB's Enclosure 4* restates the OSD outlay phasing for the Procurement/Purchases cost element for naval appropriations. These outlays do not apply to pay or fuel. **If OSD is late in issuing guidance, FMB may issue preliminary guidance using the prior year's outlay rates. Normally, the administrator should wait until final outlays are available before issuing the calculator.**

C. Composite Weighting of Appropriation Components:
A third item, though one usually not available until March annually, is information on the relative shares of components wihin appropriations (such as for O&M appropriations, the relatives shares of Civilian Pay, Fuel, and Purchases). The weights used to calculate the composite indices are obtained from an Excel file prepared annually by N801, typically in March.

D. SCN (Bureau of Labor Statistics/BLS) Index:
Additionally, NAVSEA users desire an index to use for SCN that uses historical shipbuilding rates obtained from the Bureau of Labor Statistics (BLS) for past years, and OSD rates for future rears. The BLS rate for the past year is obtained from Ms. Lisa Pfeiffer at NAVSEA (contact info in Appendix 1).

III. Update Rates in the Inflation Update File

This file is where the updater inputs the current inflation rates, outlay profiles and composite weighting factors. This file then generates revised inflation tables that are manually transferred to the Inflation Calculator. There are comments at the top of most sheets that should also be reviewed before updating. This file is not protected.

The Inflation Update File consists of the following tabs, or sheets:

A. About
B. Rate Input
C. Inflation
D. 1970=1 Inflation Index
E. CombOutFac
F. Composite
G. Sheets for about 20 appropriations (RDTE, MCN, etc.)

The update procedures for these sheets are described below.

A. "About" Tab

This tab describes the latest update in general terms, and displays the outlay rates from OSD guidance. The latest OSD outlay rates and any comments regarding changes or unusual items should be added at the top of this sheet.

B. "Rate Input" Tab

This sheet is updated with inflation rates from the USD (Comptroller) memorandum subject "Inflation Guidance – FYXXX President's Budget" usually issued in late January.

Only the following four rates are used. Proc and O&M Fuel come from the top block titled OUTLAYS on the attachment to the guidance. Military and Civilian Pay come from the bottom block.

- Proc
- O&M fuel
- Military Pay
- Civilian Pay

This sheet also needs the SCN (BLSHIST) rate that come from the Bureau of Labor statistics via NAVSEA, Ms. Lisa Pfeiffer (see Appendix 1). This rate should be inserted into column F (SCN BLS History…) for the last, historical year. For example, in Jan 2005, FY04 is the last historical year and NAVSEA provided the FY04 rate to place in this sheet.

Input the raw inflation rates from OSD/FMB and NAVSEA into the blue columns (D-H) on this sheet. These rates may be obtained from either OSD or FMB guidance.

Note for information only - The Military Pay and Civilian Pay raises are effective 1 January (not 30 September). Therefore, calculations in this "Rate Input" tab convert them from a calendar to a fiscal year (30 Sept) basis (see Appendix 2 for details). Columns B and C

convert the OSD calendar year pay rates in columns G & H into fiscal year rates. This calculation is done automatically and requires no action from the updater.

The "Inflation" tab, described below, will pull in the values from columns B thru F in the next processing steps.

C. "Inflation" Tab

This sheet contains raw inflation rates, with no outlay impacts. In the shaded sections, updates are pulled from the "Rate Input" sheet. For the annual update, the updater should copy the formulas from the rows for the prior update years into the rows for the latest FYDP years. Do not update the columns beyond AL since these automatically calculate the composite indices using the composite sheet. The values for the years following the last update are copied automatically from the last updated year. After completing the update for this sheet and the Rate Input sheet, transfer the updated **values** (not formulas) to the Calculator's "Inflation" sheet.

D. "1970=1 Inflation Index" Tab

This tab utilizes the inflation rates from the "Inflation" tab described above to calculate an index with a base year of FY1970 (1970=1.00000) for each appropriation or cost category. No manual update is needed for this sheet. Copy the **values** from this sheet to the same-named sheet in the Inflation Calculator file.

E. "CombOutFac" Tab

This sheet stores the Combined Outlay Factors (CombOutFac) used to generate a weighted index. This sheet pulls combined outlay factors from the individual appropriation sheets found at the back of the workbook, beginning with FY93 data. (Prior year values were copied from a separate file. Historical note: This sheet was originally calculated from the FY2003 inflation file created in Jan. 2002 by Harold Dagel, "inflation source data.xls". It combines the outlay profile into a single outlay factor by dividing the weighted index by the raw index.)

Do not modify or update the columns beyond AL since these automatically calculate the composite outlay factors using the composite sheet. After updating this sheet and the appropriation sheets, these values will be transferred to the Calculator's CombOutFac sheet, where they calculate the Weighted indices.

F. "Composite" Tab

The Composite weights in this tab are the percents that each cost element contributes to composite appropriations. O&MN, for example, is made up of Civilian Pay, Fuel and Purchases. These component weights -- used to calculate the composite indices -- are obtained from N801 and are updated after they are received from N801. N801 calculates the composite weights for each appropriation annually, using an Excel file, and produces the Excel file, usually in March. NCCA maintains 13 composite appropriations.

The composite weights are copied from the "Weights…" sheet in the N801 Excel file. Copy the weights from the gray area and paste them (use Paste Special, Values, Transpose) into this "Composite" sheet for each of the thirteen composite appropriations. Only the FYDP years need to be transferred. N801 weights do not change after the FYDP years. Shaded rows on the "Composite" sheet indicate the last updated years. Subsequent years beyond the FYDP are automatically copied from the last updated year, consistent with N801's file.

G. Appropriation Sheet Tabs (RDTE, MCN, etc.)

There are about 20 appropriation sheets that pull the purchases inflation rate from the "Rate Input" sheet and hold the outlay rates for each appropriation. Their formats and calculations are identical. They calculate a raw index (col. C) a weighted index (col. D) and the weighted index factor (col. F) for each year. See Appendix 3 for an explanation of the weighted index calculation. The weighted index factors, also called combined outlay factors are then automatically pulled into the "CombOutFac" sheet.

Each appropriation sheet must be updated annually with the latest Outlay Profile rates (in columns H through N). Enter the outlay rates from the OSD or FMB guidance attachments to each appropriation sheet.. Transfer into the row two years prior to the year the data is received. Subsequent rows are automatically copied from the input row. *(For example, in Jan. 03 NCCA received the outlay rates for use in the FY04/05 budget. These were used to update the outlay rates in FY01 [i.e, Jan 03 reflected recent FY01 experience]. FY00 was not changed and becomes the permanent historical rates.)* Each annual update, the FYDP and the prior 2 years are updated. The third year prior to the FYDP is not updated and becomes permanent history.

Note that only the "Purchases" escalation rate will be processed with Combined Outlay Factors -- Fuel and Pay are expected to outlay 100% in the initial year.

The following table has examples of how these sheets are updated.

For Update In	For Budget Yr FY	Change this & following yrs	This yr becomes historic
Jan 03	04	01	00
Jan 04	05	02	01
Jan 05	06	03	02
Jan 06	07	04	03

IV. Update the Inflation Calculator

This section describes how the Calculator is updated annually with revised tables from the Inflation Update File. The Calculator file has 13 sheets, four are hidden and all visible sheets except for the Inflation Table are protected to prevent inadvertent changes. The six sheets shown **bolded** below are updated annually. The sheets should be unhidden and un-protected in order to update.

1. **Main**
2. Query
3. Inflation Table
4. Multi Appn
5. **SAR**
6. SAR Calc
7. Titles
8. Def. & Links
9. Instructions
10. **1970=1 Infl Index - hidden**
11. **Inflation - hidden**
12. **CombOutFac - hidden**
13. **Composite**

A. Steps for Updating the Inflation Calculator

1: Update The Calculator's "Main" sheet for:

A. Date of the latest update and version
B. Budget year supported
C. Change picture in upper right corner to help identify year (optional)
D. Update text box for latest status and notice of significant changes, corrections etc. since the last update, if any

2: Update the "Inflation," "1970=1 Infl Index," and "CombOutFac" sheets. Copy the **values** (using *EXCEL Edit/Copy…then Edit/Paste/Special/Values*) from the three sheets in the Update file and transfer them to the same sheets in the Calculator file. Transfer **values** for all years and all appropriations. Before updating, these sheets must first be un-hidden in the Calculator. After completing the transfer, hide these sheets in the Calculator to avoid user confusion.

3: Update the Composite sheet when N801 provides new composite weights (usually in March). Transfer the values for composite weights from the "Composite Tab" of the Update file to the "Composite" sheet in the Calculator.

4: Update the SAR parameters as necessary in the SAR tab. SAR parameters are obtained from Ms. Paulette Whitaker, Program Analyst ASN(RDA), 614-0145, Rm. 5C547. These are transferred directly into the SAR worksheet. *These are included as information for users preparing SAR reports and are not used in processing of inflation indices.*

5: If there are any changes to appropriations or processes, the "Titles" and "Instructions" sheets also should be updated. After completing the updates hide the appropriate sheets and protect all the visible sheets expect the Inflation Table sheet.

B. Validation and Web Publication

After the updates are checked and tested, the Calculator should be sent to NAVSEA and NAVAIR staff only (see POCs in Appendix 1) for technical review. After their review, the updater should protect the file and put on the NCCA web site with notice of its availability. The calculator may be sent to other POCs as well for review and concurrence.

C. Update Documentation

This documentation should be updated to reflect any process or other significant changes made to the Inflation Calculator or Update files.

Appendix 1: Inflation Contacts

FMB
Judy Parker FMB-325 (703) 695-5841

ASN(RD&A)
Paulette Whitaker, ASN(RDA), 614-0145, Rm. 5C724. Provides SAR parameters.
Coral Ramsey (703) 614-0160. Works with Paulette Whitaker.

NAVAIR
Kang Hu
Lara Rupinski (301) 342-0252, Fax (301) 342-2397 NAVAIR contractor for inflation
Ron Kabin (301) 342-2441 NAVAIR inflation POC

NAVSEA
Lisa Pfeiffer SEA-017 (202) 781-2766.
Fax (202) 781-4661
Runs NAVSEA's inflation calculator and provides SCN (BLS) historical inflation.

N801
CDR John Coronado (703) 692-5433

OUSD(C) DoD Comptroller, Plans and Systems
Marie Curtain, (703) 697-3345 3A862, OSD Comptroller staff. Source of OSD Inflation Guidance
Robert Shue 697-9197

Appendix 2: Pay Conversion from Calendar to Fiscal Year

OSD provides the military and civilian pay raise effective Jan. 1. To be consistent with the budget and other cost elements, NCCA converts these to a fiscal year basis. There are two methods used for this conversion. The first, Method 1 below, is simpler, but does not include the compounding effect of the raises. Method 2 is preferred – see sample calculations on the following page, with description below:

For the following formulas, let:
R1 = pay raise that becomes effective Jan. 1 of FY1
R2 = pay raise that becomes effective Jan. 1 of FY2
Monthly pay at first month of FY1 = $1/mo

FY2 pay consists of 3 months of R1 (Oct-Jan) and 9 months of R2 (Jan-Sep).

Method 1
This calculates the FY raise by taking 1 quarter of the prior year and 3 quarters of the current year.

$$\text{FY2 raise} = \frac{1*R1 + 3*R2}{4}$$

Method 2
An alternative adjustment to calculate the pay raise from FY1 to FY2 is derived as follows:

Pay in FY1, will include 9 months of the pay raise received in Jan of FY1 (R1), therefore,
Pay received in FY1 = 3 months * $1/mo + 9 months * $(1*R1)/mo

Pay in FY2, will include 3 months of the R1 raise and 9 months of the pay raise received in Jan of FY2 (R2), therefore,
Pay received in FY2 = 3 months * $(1*R1)/mo + 9 months * $(R1*R2)/mo

The pay raise from FY1 to FY2 is Pay in FY2/Pay in FY1 =

$$\frac{3 \text{ months} * \$(1*R1)/\text{mo} + 9 \text{ months} * \$(R1*R2)/\text{mo}}{3 \text{ months} * \$1/\text{mo} + 9 \text{ months} * \$(1*R1)/\text{mo}}$$

This simplifies to:

$$\frac{1 + 3R2}{1/R1 + 3}$$

Note the rates should be entered in the form 1.0X. For example a 4% rate would be entered as 1.04.

Methods to Convert Pay Raise from Calendar to Fiscal Year

This sheet shows emperically how a calendar years raise affects the fiscal year pay increase, and compares two conversion formuals for converting CY to FY. It shows the second formula is accurate.
For the following formulas, let:
R1 = pay raise that becomes effective Jan. 1 of FY1
R2 = pay raise that becomes effective Jan. 1 of FY2
Monthly pay at first month of FY1 = $1/mo

	Mo.	Raise	Pay							
FY1	o		1.0000							
	n		1.0000							
	d	(R1)	1.0000							
CY1	j	1.037	1.0370	CY1 raise takes effect						
	f		1.0370							
	m		1.0370							
	a		1.0370							
	m		1.0370							
	j		1.0370							
	j		1.0370							
	a		1.0370							
	s		1.0370	**12.333**	Total pay received in FY1					
FY2	o		1.0370							
	n		1.0370							
	d	(R2)	1.0370							
CY2	j	1.046	1.0847	CY2 raise takes effect						
	f		1.0847							
	m		1.0847							
	a		1.0847							
	m		1.0847							
	j		1.0847							
	j		1.0847							
	a		1.0847							
	s		1.0847	**12.8733**	Total pay received in FY2					
	o		1.0847							
	n		1.0847		Pay increase from FY1 to FY2				12.8733	
	d		1.0847		(FY2 pay/FY1 pay) =				12.333	**1.043811**

Method 1

Raise = $\frac{1*R1 + 3*R2}{4}$

				R1	R2		FY raise		
		FY2		1.037	1.0460				
		quarters		1	3	sum	/4		
				1.037	3.1380	4.1750	**1.04375**		
							Close but not exact		

Method 2

Raise = $\frac{1 + 3R2}{1/R1 + 3}$

				R1	R2				
				1.037	1.0460				
					3.0000				
					3.1380				
					FY2	4.1380	**1.04381**	Exact match	
					FY1	3.96432			

Appendix 3: Outlay or Spend-out Rates

Applying spend-out rates (outlay profile) to prior two years

NCCA, NAVAIR, N801 (in support of N80 programming) and NAVSEA use the current OSD outlay profile to calculate weighted indices for the prior two years as well as future years. As a result, the permanent weighted inflation rates for historic years are based on the outlay profile that was published by OSD two years later.

There is no documentation for this two-year lag method. An alternative method would be to adjust only the current and future years so that the historic weighted inflation rates would be based on the outlay current at the time, not two year in the future.

John Cewe of OSD, explained that he uses the prior three years of historical outlays reported by the Treasury to estimate the current outlay profile contained in the annual OSD guidance. This method supports a three-year lag since the current outlay profile reflects the actual outlay from three years prior.

Alternate Methods to Convert between TY$ and FY$

Derivation of the Formula to Calculate the Weighted Index

Assume that expenditures are reported in then-year or current dollars rather than in constant or base-year dollars. This is the assumption made by the OSD staff that develops the outlay/spend-out rates.

$K = cost in constant or base-year
$TY = cost in then-year
Ei = percent expenditure in year i
Ri = raw inflation index in year i

By definitions, $TY = $K * Ri
And $K = $TY / Ri
When outlays are spread among multiple years,

$$\$K = \frac{\$TY*E1}{R1} + \frac{\$TY*E2}{R2} + \ldots + \frac{\$TY*Ei}{Ri}$$

$$\$K = \$TY * \left(\frac{E1}{R1} + \frac{E2}{R2} + \ldots + \frac{Ei}{Ri}\right)$$

$$\$K * \left[\frac{1.}{\left(\frac{E1}{R1} + \frac{E2}{R2} + \ldots + \frac{Ei}{Ri}\right)}\right] = \$TY$$

The figure in brackets is the factor used to develop the weighted index. This is illustrated and compared with an alternative calculation, shown below.

Mar-03

Comparison of Methods to Calculate FY to TY Weighting Factors

This sheet examins the factors to convert between FY and TY. It establishes a sample case and determines emperically the difference (factor) between the observed TY$ and the de-escalated FY$. It then uses two formulas to calculate the same factor. The first method is accurate.

Sample Case Assumptions						
Expenditure Year	1999	2000	2001	2002	Total	
Spend-out Rate observed TY$ (%/yr)	25.00%	25.00%	25.00%	25.00%	100.00%	
Raw Inflation Rate	10.0%	10.0%	10.0%	10.0%		
Raw Index calculated from above rates	1.0000	1.1000	1.2100	1.3310		
Sample Case Calculation					Total	
TY$ Observed	250.0	250.0	250.0	250.0	1,000.0	TY$
De-escalate TY$ to '99$ using raw index	250.0	227.3	206.6	187.8	871.7	FY$
TY$/1999$					**1.1472**	

2 Methods to calculate the FY to TY weighting factor						**Factor**
					sum	1/sum
Method 1 (NCCA)	0.2500	0.2273	0.2066	0.1878	0.8717	**1.1472**
1 / sum (spend-out rate/raw index)						
						sum
Method 2 (Old)	0.2500	0.2750	0.3025	0.3328		**1.1603**
sum of (spend-out rate * raw index)						

Appendix 4: Alternative Calculations for Composite Rates

Discussion of Alternatives for Calculating Composite Inflation Rates and Indices

NCCA (FMB-6) has examined 2 methods for calculating inflation rates and indices for composite appropriations. This analysis was made in response to questions regarding differences between the index generated by NCCA's Inflation Calculator and an index calculated by hand from the underlying cost elements.

The following table (Excel spreadsheet extract) presents data and calculations for a composite appropriation (RDT&E) made up of 2 cost elements, civilian pay and purchased material. Sample data are used in this example. Annual inflation rates for each element are supplied in cols 1 and 3; inflation indexes for each of these elements in cols 2 and 4 are calculated from respective rate inputs. The index calculation sets FY2000 as 1.00, and then utilizes the rates in cols 1 and 3 to generate each year's index.

The weights in cols 5 and 6, approximating those provided by N80 staff, are the proportion each element contributes to the RDT&E composite appropriation. Column 7 reflects that the two elements sum to 100%.

The RDT&E composite rate in col 8 is calculated by weighting the elemental rates in cols 1 and 3 with the composite weights in cols 5 and 6. The composite "index 1" in column 9 is derived from the composite rate in col 8 (using the same method used to calculate indexes in cols 2 and 4, described above). The column 9 technique is the same method used by the NCCA Inflation Calculator.

The alternate "index 2" in column 10 is calculated by weighting the elemental indexes in cols 2 and 4 with the composite weights in cols 5 and 6. This was the method used by others to check the consistency of the Inflation Table generated by the NCCA Inflation Calculator.

Resulting values in Indexes 1 and 2 are different. This is not due to errors in calculation, but a result of the alternative calculation methods. Finally, note that the resulting inflation rates derived from index 2 -- shown in col 11 -- are different from the composite rates presented earlier in col 8.

After some investigation and debate, NCCA determined that index 1 is preferable for most users. The composite weights are determined for a particular year and, therefore, properly apply to the rate for that year, not to an index that incorporates the rates from prior years. A notable factor is that users expect consistency between the composite rate and associated composite index and are less concerned with consistency between composite and component indexes. Therefore, NCCA will continue with the methodology used to calculate index 1.

Col.#	1	2	3	4	5	6	7	8	9	10	11
	Cost Elements										
FY	1. Civ pay		2. Purchases		Composite Weights			RDT&E Composite Appropriation			
	rate	index	rate	index	civ	purch	tot	composite rate	index 1	index 2	rate for index 2
2000	3.00%	1.00000	1.50%	1.00000	2%	98%	100%	1.5300%	1.00000	1.000000	
2001	4.00%	1.04000	2.00%	1.02000	3%	97%	100%	2.0600%	1.02060	1.020600	2.0600
2002	5.00%	1.09200	3.00%	1.05060	4%	96%	100%	3.0800%	1.05203	1.052256	3.1017
2003	4.00%	1.13568	2.00%	1.07161	3%	97%	100%	2.0600%	1.07371	1.073534	2.0221
2004	3.00%	1.16975	1.50%	1.08769	2%	98%	100%	1.5300%	1.09013	1.089327	1.4712

Other Notes on Excel Mechanics

To highlight the base year row, cells with value = 1.0 are formatted using:
Format, Conditional Formatting

To allow user to input into certain cells while protecting the rest of the sheet