RPI Library Documentation ptions

Version 1.0.3

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DESCRIPTION

The RPI Library is a library of Microsoft Excel Add-Ins functions designed by Alpha Options LLC to value and measure the risks of futures and options contracts written on relative performance indexes. A relative performance index is a measure of the relative risk-adjusted performance of a target security relative to a benchmark. The relative risk-adjustment factor for the index is defined as b and the index updating rule is defined as:

 $I_{t+1} = I_t \times \frac{(1 + \text{daily return on security}_{t+1})}{(1 + \text{daily return on benchmark}_{t+1})^b}$

where the daily returns include both price appreciation and dividend income. The functions are based on the analytical formulas contained in:

Sagi, Jacob S. and Whaley, Robert E., Trading Relative Performance (May 11, 2011): Available at SSRN: http://ssrn.com/abstract=1692738

This documentation describes how to use the valuation and risk measurement functions contained in the RPI Library.

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INSTALLATION INSTRUCTIONS

1) The file **Alpha Options LLC.zip** is a zipped file containing the installation program for the **RPI Library**. Click on **Alpha Options LLC.zip**, and the following screen will appear. Double click on **RPI Setup.msi**.



3) Unless specified otherwise, the program files will be installed in the subdirectory, **RPI Library**, on your C: drive. Click on **Next**.

	揭 RPI Library Setup	
	Select Installation Folder This is the folder where RPI Library will be installed.	<u>e</u>
	To instal in this folder, click "Next". To install to a different folder, entr "Browse". <u>Folder:</u> C:\RPI Library\	er it below or dick Browse
	Advanced Installer < Back Next >	Cancel
4) Click on Install	-	×
	Ready to Install The Setup Wizard is ready to begin the RPI Library installation	
	Click "Install" to begin the installation. If you want to review or chang installation settings, click "Back". Click "Cancel" to exit the wizard.	e any of your
		P
	Advanced Installer < Back Insta	I Cancel

5) Installation is complete.



6) An icon α will appear on your desktop. Double-click on the icon α and then on **Enable** this add-in for this session only. The RPI Library will then load into Excel.



7) From Excel, open the file **Relative performance products.xls**.

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👪 Drivers	*	Name	Date modified	Туре	Size
Je Fortran		Relative performance products	5/27/2011 10:48 AM	Microsoft Excel W	91 k
PerfLogs Program Files Program Files REW	ш	API Library	5/27/2011 10:48 AM	Microsoft Excel XL.,	256 K

REMOVAL INSTRUCTIONS

The **RPI Library** can be removed from your PC using the **Uninstall a program** feature of the **Control Panel**.



PROGRAM USE

Relative performance products.xlsx is an Excel file with two worksheets that demonstrate the application of the RPI Library routines—one Protected and the other Unprotected. The Protected sheet does not permit editing other than for the input parameters on the left hand-side of the page. The Unprotected sheet permits editing of all fields so as to allow the user to experiment with the different valuation functions.

Below is the Protected sheet with the default input parameters. Note that the highlighted box has a reported futures value of 103.832. The syntax for this function call is

RPI_FUTURES_VALUE(i,b,vs,vm,rho,r,t)

where the futures value is computed based on the relative performance index level (i), the relative risk-adjustment coefficient (b), the target security volatility (vs), the benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r) expressed as an annualized rate and time remaining to expiration (t) expressed in years.

	нз 🗸 🕤	fx	=RPI_FU	TURES_VALUE(\$C\$1	1,\$C\$12,\$	C\$4,\$C\$8,\$C\$	9,\$C\$	15,\$C\$19)			
24	A B	С	DE	F	G	H I	J	К	L	М	N
1			Re	lative Performance	Index F	utures and O	ption	s Valuation			
2	Stock parameters		Futi	ures			Opt	tions		Call	Put
3	Price	50.00	7	ahue		103.83158		Value		27.56259	4.20290
4	Volatility	30%	I	mplied correlation	27	0.10000]	Implied correlation		-63.75385	
5											
6	Market parameters		E	elta - index	I	1.03832]	Delta - index	I	0.83415	-0.18361
7	Price	35.00	E	elta - stock	S	2.07663	1	Delta - stock	S	1.66830	-0.36722
8	Volatility	20%	E	elta - market	M	-3.26328	1	Delta - market	M	-2.62161	0.57705
9	Correlation	0.100									
10			G	amma - index	п	0.00000		Gamma - index	п	0.00756	
11	Alpha Index	100.00	G	amma - stock	SS	0.00000		Gamma - stock	SS	0.03023	
12	Risk-adjustment	1.10	G	amma - market	MM	0.19580	-	Gamma - market	MM	0.23195	
13			G	amma - cross	SM	-0.06527		Gamma - cross	SM	-0.09994	
14	Other market parameter	ers	G	amma - cross	MS	-0.06527		Gamma - cross	MS	-0.09994	
15	Interest rate	2.00%									
16			7	ega - stock	S	-2.28429	1	Vega - stock	S	19.17664	21.41571
17	Option contracts		V	ega - market	Μ	44.54375	1	Vega - market	Μ	51.58155	7.91983
18	Exercise price	80	1	ega - rho	R	-6.85288	1	Vega - rho	R	-10.49378	-3.77659
19	Years to expiration	1								1	
20			Copyrig	ht 2010-11 © by A	lpha Opti	ions LLC. Al	l righ	ts are reserved.			

To understand how to call such functions from the RPI Library, place the cursor **Formulas** in the menu bar.

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File	Home	Insert	Page	Layout	For	mulas	Data	Review	View	Developer	Acrobat	Team
<i>fx</i> Insert	X AutoSum	Recently	Financial	Logical	A Text	Date &	Lookup &	H ath	More	Name	Define Nam	ie ▼ iula ∽
Function	÷	Used *	*	Function	n Librar	Time *	Reference *	& Trig *	Functions *	Manager	Defined Names	Selection

Click the **Insert Function** button at the top left hand-side of the page. The menu below will appear. In the window to the right of the label **Or select a category:**, select either **RPI futures** or **RPI options**, which include the valuation/risk functions for RPI futures and RPI options, respectively. Click **OK**.

Type a brief description of	f what you want to do and	then dick	30	
Or select a category: RPI	futures	-		
Select a function:	up & Reference	^		()
RPI FUTURES DELT/Text	t cal		~	
RPI_FUTURES_IRHO Info	rmation r Defined			
RPI_FUTURES_VEGA Engi	neering e	E		
Com	patibility futures and options		~	U
RPI_FUTURES_DEL	futures			
annualized and in decimal f	options orm. Time to expiration is	measured in years.	re	
				0
				\mathbf{O}
Help on this function	F	ОК Са	ncel	
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If you click RPI futures, the futures functions appear. Choose from the list (e.g., RPI_FUTURES_DELTA).

earch for a function:			
Type a brief descript Go	on of what you want to do and then d	lick <u>G</u> o	
Or select a category:	RPI futures	-	
elect a function:			
RPI_FUTURES_DELT	A		~
RPI_FUTURES_GAM	1A		
RPI FUTURES VALU			
RPI_FUTURES_VALU RPI_FUTURES_VEGA			
RPI_FUTURES_VALU RPI_FUTURES_VEGA			Ŧ
RPI_FUTURES_VALU RPI_FUTURES_VEGA RPI_FUTURES_DEL Returns value of futu annualized and in dec	TA(i,b,s,m,vs,vm,rho,r,t,und) res contract on relative performance ir mal form. Tme to expiration is measu	ndex. Rates are red in years.	Ŧ
RPI_FUTURES_VALU RPI_FUTURES_VEGA RPI_FUTURES_DEL Returns value of futu annualized and in dec	TA(i,b,s,m,vs,vm,rho,r,t,und) res contract on relative performance in mal form. Tme to expiration is measu	ndex. Rates are red in years.	-

After a particular function is called, the User is prompted for the necessary input parameters (or Function Arguments, as Excel refers to them).

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в				
s			-	
м	=			0
Vs	=		-	-
	= -99	Datas are appreciated an	d in decimal	\cap
Returns value of futures cont form. Time to expiration is me	ract on relative performance index. I easured in years. I Index level.	Rates are annualized an		

A complete list of the available function descriptions is contained in the following pages.

FUTURES VALUATION FUNCTIONS - Syntax

RPI_FUTURES_VALUE(i,b,vs,vm,rho,r,t)

Returns futures price given relative performance index level (i), relative risk-adjustment coefficient (b), target target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r) and time remaining to expiration (t).

RPI_FUTURES_DELTA(i,b,s,m,vs,vm,rho,r,t,und)

Returns futures delta given relative performance index (i), relative risk-adjustment coefficient (b), per share target price (s), per share benchmark price (m), target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r), time remaining to expiration (t), and underlying indicator (und). Set underlying indicator to "I" for delta with respect to relative performance index, "S" target price, and "M" benchmark price.

RPI_FUTURES_GAMMA (i,b,s,m,vs,vm,rho,r,t,und)

Returns futures gamma given relative performance index (i), relative risk-adjustment coefficient (b), per share target price (s), per share benchmark price (m), target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r), time remaining to expiration (t), and underlying indicator (und). Set underlying indicator to "II" for gamma with respect to relative performance index, "SS" target price, and "MM" benchmark price. For cross-gammas, set indicator variable to "SM" or "MS".

RPI_FUTURES_VEGA(i,b,vs,vm,rho,r,t,vf)

Returns futures vega given relative performance index (i), relative risk-adjustment coefficient (b), target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r), time remaining to expiration (t), and volatility type (vf). Set volatility type to "S" for vega with respect to target volatility, "M" benchmark volatility, and "R" correlation between target and benchmark returns.

RPI_FUTURES_IRHO (i,b,vs,vm,fp,r,t)

Returns implied correlation between target and benchmark returns given relative performance index level (i), relative risk-adjustment coefficient (b), target volatility (vs), benchmark volatility (vm), risk-free interest rate (r), futures price (fp) and time remaining to expiration (t). If the futures price is not consistent with correlations between -1 and 1, then the function returns -9999 (if the implied correlation is less than -1) or 9999 (if the implied correlation is above 1).

OPTION VALUATION FUNCTIONS - Syntax

RPI_OPTION_VALUE(i,b,vs,vm,rho,r,x,t,cp)

Returns option value given relative performance index level (i), relative risk-adjustment coefficient (b), target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r), exercise price (x), time remaining to expiration (t), and call/put indicator (cp). Set call/put indicator to "C" for call option, and "P" for put option.

RPI_OPTION_DELTA(i,b,s,m,vs,vm,rho,r,x,t,cp,und)

Returns option delta given relative performance index level (i), relative risk-adjustment coefficient (b), per share target price (s), per share benchmark price (m), target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r), exercise price (x), time remaining to expiration (t), call/put indicator (cp), and underlying indicator (und). Set call/put indicator to "C" for call option, and "P" for put option. Set underlying indicator to "I" for delta with respect to relative performance index, "S" target price, and "M" benchmark price.

RPI_OPTION_GAMMA(i,b,s,m,vs,vm,rho,r,x,t,cp,und)

Returns option gamma given relative performance index level (i), relative risk-adjustment coefficient (b), per share target price (s), per share benchmark price (m), target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r), exercise price (x), time remaining to expiration (t), call/put indicator (cp), and underlying indicator (und). Set call/put indicator to "C" for call option, and "P" for put option. Set underlying indicator to "II" for gamma with respect to relative performance index, "SS" target price, and "MM" benchmark price. For cross-gammas, set indicator variable to "SM" or "MS".

RPI_OPTION_VEGA(i,b,vs,vm,rho,r,x,t,cp,vf)

Returns option vega given relative performance index level (i), relative risk-adjustment coefficient (b), target volatility (vs), benchmark volatility (vm), correlation between target and benchmark returns (rho), risk-free interest rate (r), exercise price (x), time remaining to expiration (t), call/put indicator (cp), and volatility type (vf). Set call/put indicator to "C" for call option, and "P" for put option. Set volatility type to "S" for vega with respect to benchmark volatility, "M" benchmark volatility, and "R" correlation between target and benchmark returns.

RPI_OPTION_IRHO(i,b,vs,vm,op,r,x,t,cp)

Returns implied correlation between target and benchmark returns given relative performance index level (i), relative risk-adjustment coefficient (b), target volatility (vs), benchmark volatility (vm), option price (op), risk-free interest rate (r), exercise price (x), time remaining to expiration (t), and call/put indicator (cp). Set call/put indicator to "C" for call option, and "P" for put option. Implied correlations, in general, may not have a unique solution. Moreover, some prices are not consistent with correlations strictly between -1 and 1. In some instances, if there is more than one solution (or no solution) or the solution is very close (or equal) to one, the function returns -9999 or 9999.