Overview Functions

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1 Value at Risk (VaR)		
empirical VaR_α	`finrisk_VaRemp` – inputs: `alpha_vec`, `l_vec`	sec. 3.7.1

parametric VaR_α (normal, t)	`finrisk_VaRpar`
	– inputs: `alpha_vec`, `distr`, `par_vec`
	`finrisk_VaRpar_data`
	– inputs: `alpha_vec`, `distr`, `l_vec`, `estmeth`
		sec. 2.4.8.1, 2.E

Cornish-Fisher VaR_α	`finrisk_VaRcf`
	– inputs: `alpha_vec`, `muL`, `stdL`, `skewL`, `kurtL`
	`finrisk_VaRcf_data`
	– inputs: `alpha_vec`, `l_vec`
		sec. 2.4.8.3

peaks-over-threshold VaR_α	`finrisk_VaRpot`
	– inputs: `alpha_vec`, `xi`, `beta`, `u`, `Nu`, `T`
	`finrisk_VaRpot_data`
	– inputs: `alpha_vec`, `l_vec`
		sec. 3.9.1

normal mixture VaR_α	`finrisk_VaRmix`
	– inputs: `alpha_vec`, `p_vec`, `mu_vec`, `sigma_vec`
	`finrisk_VaRmix_data`
	– inputs: `alpha_vec`, `l_vec`, `nrep_est`
		sec. 2.F

2 Expected Shortfall (ES)/Conditional Value at Risk (CVaR)		
empirical ES_α	`finrisk_ESemp` – inputs: `alpha_vec`, `l_vec`	sec. 3.7.3
empirical CVaR_α^1	`finrisk_CVaRemp1` – inputs: `alpha_vec`, `l_vec`	sec. 3.7.3
empirical CVaR_α^2	`finrisk_CVaRemp2` – inputs: `alpha_vec`, `l_vec`	sec. 3.7.3

parametric ES_α (normal, t)	`finrisk_ESpar`
	– inputs: `alpha_vec`, `distr`, `par_vec`
	`finrisk_ESpar_data`
	– inputs: `alpha_vec`, `distr`, `l_vec`, `estmeth`
		sec. 2.8.8.1, 2.E

Cornish-Fisher ES_α	`finrisk_EScf`
	– inputs: `alpha_vec`, `muL`, `stdL`, `skewL`, `kurtL`
	`finrisk_EScf_data`
	– inputs: `alpha_vec`, `l_vec`
		sec. 2.G

peaks-over-threshold ES_α	`finrisk_ESpot`
	– inputs: `VaRvec`, `xi`, `beta`, `u`
	`finrisk_ESpot_data`
	– inputs: `alpha_vec`, `l_vec`
		sec. 3.9.1

normal mixture ES_α	`finrisk_ESmix`
	– inputs: `alpha_vec`, `p_vec`, `mu_vec`, `sigma_vec`
	`finrisk_ESmix_data`
	– inputs: `alpha_vec`, `l_vec`, `nrep_est`
		sec. 2.F

3 Backtests		
hits	`finrisk_testVaR_hits` – inputs: `l_vec,VaR_vec`	sec. 3.11.1
unconditional coverage test	`finrisk_testVaR_h` – inputs: `hits, alpha, use_first_obs` – outputs: `LR_h,p_h`	sec. 3.11.2
independence test	`finrisk_testVaR_i` – inputs: `hits` – outputs: `LR_i,p_i`	sec. 3.11.3
conditional coverage test	`finrisk_testVaR_c` – inputs: `hits, alpha` – outputs: `LR_c,p_c`	sec. 3.11.4
4 Conditional/Dynamic VaR and ES		

rolling window volatility	`finrisk_volroll`
	– inputs: `pre_sample, sample,inc_mean,...`
	`T_roll`	

EWMA volatility ($\lambda = 0{,}94$)	`finrisk_volewma`
	– inputs: `pre_sample, sample,inc_mean,...`
	`T_roll`
		sec 3.3

GARCH(1,1) volatility	`finrisk_volgarch_par`
	– inputs: `pre_sample, sample, alpha0,...`
	`alpha1, beta1, mu, ver_sig0`
	`finrisk_volgarch`
	– inputs: `est_sample,pre_sample, sample,...`
	`inc_mean`
		sec 3.4

rolling window VaR_α (normal, HS, POT)	`finrisk_dynVaRroll`
	– inputs: `alpha_in, method, pre_sample, ...`
	`sample, T_est, t_update`
		sec 3.8

rolling window ES_α (normal, HS, POT)	`finrisk_dynESroll` – inputs: see `finrisk_dynVaRroll`	

EWMA-VaR_α (normal)	`finrisk_dynVaRewma`
	– inputs: `alpha_in,pre_sample, sample,...`
	`inc_mean`
		sec 3.3

GARCH-VaR_α (normal, FHS, POT)	`finrisk_dynVaRgarch`
	– inputs: `alpha_in, method, pre_sample, ...`
	`sample,T_est, t_update, inc_mean, show_info`
		sec 3.4

GARCH-ES_α (normal, HS, POT)	`finrisk_dynESgarch` – inputs: see `finrisk_dynVaRgarch`	
5 Portfolio risk and its decomposition		
historical simulation VaR_α	`finrisk_pfVaR_hsim` – inputs: `alpha_vec,w1,l1,l2,method`	
historical simulation ES_α	`finrisk_pfES_hsim` – inputs: `alpha_vec,w1,l1,l2,method`	

variance-covariance approach	`finrisk_pfVaR_vc`
	– inputs: `alpha_vec,w1,mu_vec,Sig_mat`
	`finrisk_pfVaR_vc_data`
	– inputs: `alpha_vec,w1,l1,l2`
	`finrisk_pfES_vc`
	– inputs: `alpha_vec,w1,mu_vec,Sig_mat`
	`finrisk_pfES_vc_data`
	– inputs: `alpha_vec,w1,l1,l2`	

meta distribution	`finrisk_pfVaR_metasim` – inputs: `alpha_vec,w1,l1,l2,marg_type,cop_type,Nsim` – outputs: `VaR, ES, meta_par, l_mat`	sec. 5.D.3
proportional allocation	`finrisk_pfdeco_prop` – inputs: `riskpf,risk1,risk2`	sec. 9.7.1

covariance allocation	`finrisk_pfdeco_covlw`
	– inputs: `riskLp,mulw,covlw`
	`finrisk_pfdeco_covl`
	– inputs: `riskpf,w1,muLR,SigLR`
		sec. 9.7.2

6 Derivatives		
call price	`finrisk_call_price`	eq. (4.2.5)
	– inputs: `s, x, r, sigma, tau`	
call delta	`finrisk_call_delta`	eq. (4.4.40)
	– inputs: `s, x, r, sigma, tau`	
call gamma	`finrisk_call_gamma`	eq. (4.5.18)
	– inputs: `s, x, r, sigma, tau`	
call theta	`finrisk_call_theta`	
	– inputs: `s, x, r, sigma, tau`	
put price	`finrisk_put_price`	eq. (4.2.12)
	– inputs: `s, x, r, sigma, tau`	
put delta	`finrisk_put_delta`	eq. (4.4.40)
	– inputs: `s, x, r, sigma, tau`	
put gamma	`finrisk_put_gamma`	
	– inputs: `s, x, r, sigma, tau`	
put theta	`finrisk_put_theta`	
	– inputs: `s, x, r, sigma, tau`	
VaR_α exact	`finrisk_call_VaR`	eq. (4.2.8)
	– inputs: `alpha, h, mu, s0, x, r, sigma, tau, incTheta`	
	– outputs: `VaRl, VaRs`	
	`finrisk_put_VaR`	eq. (4.2.13)
	– inputs and outputs: see `finrisk_call_VaR`	
VaR_α delta approx. (exact)	`finrisk_call_VaR_delta1`	eq. (4.4.44)
	– inputs and outputs: see `finrisk_call_VaR`	
	`finrisk_put_VaR_delta1`	eq. (4.4.46)
	– inputs and outputs: see `finrisk_call_VaR`	
VaR_α delta approx. (normal)	`finrisk_call_VaR_delta2`	eq. (4.4.45)
	– inputs and outputs: see `finrisk_call_VaR`	
	`finrisk_put_VaR_delta2`	eq. (4.4.47)
	– inputs and outputs: see `finrisk_call_VaR`	
VaR_α delta-gamma approx.	`finrisk_call_VaR_gamma`	sec. 4.5.5
	– inputs and outputs: see `finrisk_call_VaR`	
	`finrisk_put_VaR_gamma`	
	– inputs and outputs: see `finrisk_call_VaR`	
VaR_α Monte Carlo simulation	`finrisk_call_VaR_sim`	
	– inputs: `N,alpha,h,mu,s0,x,r,sigma,tau,incTheta`	
	– outputs: `VaRl, VaRs, lsim_l, lsim_s`	
	`finrisk_put_VaR_sim`	
	– inputs: `N,alpha,h,mu,s0,x,r,sigma,tau,incTheta`	
	– outputs: `VaRl, VaRs`	

7 Credit risk		
7.1 Credit risk – independent defaults		
exact (binomial) distribution	`finrisk_cppdf_hind`	sec. 5.2.1
	– inputs: `xvec,PD,n,E,typ_l`	
	`finrisk_cpcdf_hind`	sec. 5.2.1
	– inputs: `xvec,PD,n,E,typ_l`	
	`finrisk_cpVaR_hind`	sec. 5.2.1
	– inputs: `alpha_vec,PD,n,E,typ_l`	
Poisson approximation	`finrisk_cppdf_poiss`	
	– inputs: `xvec,PD,n,E,typ_l`	
	`finrisk_cpcdf_poiss`	
	– inputs: `xvec,PD,n,E,typ_l`	
	`finrisk_cpVaR_poiss`	
	– inputs: `alpha_vec,PD,n,E,typ_l`	
normal approximation	`finrisk_cpcdf_hindnv`	sec. 5.2.1
	– inputs: `xvec, PD, n, E, typ_l`	
	`finrisk_cpVaR_hindnv`	
	– inputs: `alpha_vec, PD, n E, typ_l`	
7.2 Credit risk – correlated defaults		
numerical integration	`finrisk_cppdf_hfak`	sec. 5.2.3.4
	– inputs: `xvec,PD,n,rho,E,l_typ`	
	`finrisk_cpcdf_hfak`	sec. 5.2.3.4
	– inputs: `xvec,PD,n,rho,E,typ_l`	
	`finrisk_cpVaR_hfak`	sec. 5.2.3.4
	– inputs: `alpha_vec,PD,n,rho,E,l_typ`	
LHP approximation	`finrisk_cppdf_lhp`	sec. 5.2.3.3
	– inputs: `xvec,PD,n,rho,E,l_typ`	
	`finrisk_cpcdf_lhp`	sec. 5.2.3.3
	– inputs: `xvec,PD,n,rho,E,l_typ`	
	`finrisk_cpVaR_lhp`	sec. 5.2.3.3
	– inputs: `alpha_vec,PD,n,rho,E,typ_l`	
granularity adjustment	`finrisk_cpVaR_lhpgran`	sec. 5.2.3.3
	– inputs: `alpha_vec,PD,n,rho,E,typ_l`	
Monte Carlo simulation	`finrisk_cppdf_hfaksim`	sec. 5
	– inputs: `xvec,Nsim,PD,n,rho,E,typ_l, typ_am, xpar`	
	`finrisk_cpcdf_hfaksim`	sec. 5
	– inputs: `xvec,Nsim,PD,n,rho,E,typ_l, typ_am, xpar`	
	`finrisk_cpVaR_hfaksim`	sec. 5
	– inputs: `alpha_vec,Nsim,PD,n,rho,E,typ_l,typ_am, xpar`	

8 Miscellaneous functions (interface to Matlab estimation functions)		
GARCH estimation	`finrisk_est_garch`	
	– inputs: `dat`, `est_mean`, `show_info`	
	– outputs: `alpha0`, `alpha1`, `beta1`, `mu`	
POT estimation	`finrisk_est_pot`	
	– inputs: `ldat`,`threshold`	
	– outputs: `xi`,`beta`,`u`,`Nu`,`T`	
t-dist estimation	`finrisk_est_t`	
	– inputs: `dat`, `method`	
	– outputs: `mu`, `sig_std`, `nu`, `sig_par`	
normal mixture estimation	`finrisk_est_mix`	
	– inputs: `K`, `dat`, `NReplications`	
	– outputs: `p_vec`,`mu_vec`, `sigma_vec`, `gmd`	
meta distribution estimation	`finrisk_meta_est`	sec. (5.D.3)
	– inputs: `l1`,`l2`,`marg_type`,`copula_type`	
	– outputs: `meta_par`	
meta distribution simulation	`finrisk_meta_sim`	sec. (5.D.3)
	– inputs: `meta_par`,`Nsim`	
	– outputs: `lmat`	
GBM simulation	`finrisk_gbm_price_rnd`	
	– inputs: `N`, `t`, `s0`, `mu`, `sigma`	
	– outputs: `St`	
GBM price parameters	`finrisk_gbm_price_par`	
	– inputs: `t`, `s0`, `mu`, `sigma`	
	– outputs: `ms`, `vs`	
empirical cdf	`finrisk_ecdf`	
	– inputs: `xvals`, `sample`, `denom`	
empirical LTD	`finrisk_ltd_emp`	sec. (5.D.3)
	– inputs: `xvec`, `yvec`, `alpha`	
empirical UTD	`finrisk_utd_emp`	sec. (5.D.3)
	– inputs: `xvec`, `yvec`, `alpha`	
t-copula LTD/UTD	`finrisk_td_tcop`	sec. (5.D.3)
	– inputs: `l1`, `l1`	
	– outputs: `ltd`, `utd`	