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By

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Introduction	Past evidences regarding estimation risk
Model and Methodology Data	 Investors tend to avoid risky investment if they do not have any information regarding risky asset returns [(Barry 1974), Bawa (1976), Brown (19797)]. If sample estimates are used to represent true parameters, it leads to suboptimal portfolio choices resulting in loss utility due to estimation uncertainty. [Frost and Savarino (1986), Jorion (1986, 1991), Michaud (1998), Britten-Jones (1999), and He (2007)].
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Estimation Risk Modeling in Optimal Portfolio Selection: An Empirical Study from Emerging Markets									
Introduction	 Attempts in solving estimation uncertainty: 								
	 Shrinkage estimator [Stein (1962), Effron and Morris (1973)]. 								
	 "All assets are identical" property to determine grand mean or common mean. [Frost and Savarino (1986)]. 								
	 Resample Efficient Frontier [Michaud (1998)] 								
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Introduction	Distinctions from previous studies
Model and Methodology Data	 The emerging market samples. Informative prior: asset returns comply with the single index model allowing for abnormal return on individual asset not just a known value. Compare empirical evidences of 6 portfolio formation strategies and recommend the best approach.
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	Model							
Model and Methodology	• Six optimized portfolio strategies are explored.							
	1. Traditional EV portfolio							
	 Adjusted Beta Model Resampled Efficient Frontier (REF) Capital Asset Pricing Model (CAPM) 							
	 5. Single Index Model (SIM) 6. Bayesian Single Index Model (BSIM) model 							
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Introduction Model and Methodology	If a security's historical average return differed from that of grand mean, the expected predictive return will be drawn toward the grand average by a Bayesian adjusted factor.
Data .	Prior belief in this study is that the appropriate grand mean is the expected return suggested by the single index model.
•	If asset historical average differs from that of single index model, expected predictive return will be shrunk toward expected return suggested by the single index model. 17



Introduction	Resampled Efficient Frontier (REF)
Model and Methodology	 Monte Carlo method given asset returns follow multi-variate normal distribution,
Data	$\left(\mu_{0}, \Omega_{0}\right)$
	 Determine an efficient frontier for each simulated data
	500 Historical data sets are formed
	Determined average optimum weights of investment from all resampled efficient frontiers
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Estimation Risk Modeling in Optimal Portfolio Selection: An Empirical Study from Emerging Markets								
Introduction Model and	Return generating process under the Capital Asset Pricing Model (CAPM) and Single Index Model (SIM) Approach	ne nd						
Methodology Data	$R = R_m \beta \tag{(}$ $R = R_m C + U \tag{(}$	(3) (4)						
	Where: R = vector of expected excess return on each individual asset R_{mt} = vector of expected excess market index return β = vector of beta coefficient $C \equiv \begin{bmatrix} \alpha' \\ \beta' \end{bmatrix}$ = coefficient vector							
	2	20						

	Expected Return and Covariance are shown below:	Variance-
Model and Methodology	$E(R_i) = R_m C$	(5)
Data	$\sigma_i^2 = eta_i' \sigma_m^2 eta_i + \sigma_{arepsilon_i}^2 \ \sigma_{ij} = eta_i' \sigma_m^2 eta_j$	(6) (7)
	If market efficient hypothesis holds, intercept term in the single index m zero. When alpha has a non-ze indicates mispricing for the set of tra Portfolio managers can outperform th determining and investing in non assets.	alpha or the nodel will be ero value, it aded assets. ne market by n-zero alpha 21







Estimation Risk Modeling in Optimal Portfolio Selection: An Empirical Study from Emerging Markets							
Introduction Model and Methodology	Posterior distribution can be determined by collecting terms from the product of the likelihood function and prior distribution as shown below:	d e s					
Data	$p(C,\Sigma \mid R) \propto p(R \mid C,\Sigma) p(C \mid \Sigma) p(\Sigma) $ $ \qquad \qquad$	0)					
	Where: $\widetilde{C} \equiv (V_0^{-1} + X'X)^{-1}(V_0^{-1}C_0 + X'R)$ $\widetilde{V} \equiv (V_0^{-1} + X'X)^{-1}$ $\widetilde{H} \equiv H_0 + S + C'_0V_0^{-1}C_0 + \widehat{C}'X'X\widehat{C} - \widetilde{C}'V^{-1}\widetilde{C}$						
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	Methodology
Model and Methodology	 Portfolio performances used in this study are Sharpe's Ratio and Expected Utility.
Data	• Ex-ante Sharpe's ratio is compared to out-of-sample ex-post Sharpe's ratio.
	• Data is splitted into two subperiods.
	 The first subperiod ranges from January 1995 to December 2001
	2. The second subperiod ranges from January 2002 to December 2008.
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TA	TABLE 1: Descriptive Statistics of index returns.														
						P	anel A								
	Alpha			Beta		F-Stat		Average Return		n	Standard Deviation		tion		
Country	Total Period	First Sub- period	Second Sub- period	Total Period	First Sub- period	Second Sub- period	Total Period	First Sub- period	Second Sub- period	Total Period	First Sub- period	Second Sub- period	Total Period	First Sub- period	Second Sub- period
Turkey	0.03344*** (-3.15)	0.06640*** (-3.47)	0.00389 (-0.43)	1.04746*** (-6.75)	1.24056*** (-4.48)	0.95713*** (-7.16)	45.00***	20.07***	51.29***	3.35%	5.79%	0.98%	15.59%	19.34%	10.37%
Russian Federation	0.01905*** (-2.39)	0.03654*** (-2.56)	0.00372 (-0.54)	1.37491*** (-11.83)	1.64265*** (-7.95)	1.14265*** (-11.12)	135.70***	63.23***	123.66***	1.92%	2.53%	1.08%	14.01%	17.20%	9.91%
Hungary	0.00953* (-1.71)	0.02532* (-1.71)	-0.00442 (-0.91)	0.79591*** (-9.82)	0.86536*** (-5.99)	0.76185*** (-10.56)	93.12***	35.99***	111.49***	0.96%	1.94%	0.03%	9.06%	10.83%	6.75%
Mexico	0.00894*** (-2.51)	0.01418*** (-2.23)	0.00593* (-1.82)	0.69188*** (-13.30)	0.80156*** (-8.70)	0.58642*** (-12.07)	171.37***	75.67***	145.71***	0.90%	0.87%	0.96%	6.64%	8.00%	4.93%
Brazil	0.00892*** (-2.29)	0.01287** (-1.95)	0.00643 (-1.52)	0.88102*** (-15.49)	0.98651	0.80493 (-12.76)	241.00***	106.19***	162.82***	0.90%	0.61%	1.14%	7.89%	9.08%	6.64%
China	0.00781 (-1.08)	0.00479 (-0.37)	0.00869 (-1.20)	0.90282	0.79943 (-4.30)	0.99837*** (-9.22)	69.44***	18.30***	85.04***	0.79%	-0.07%	1.49%	11.30%	12.93%	9.41%
South Africa	0.00648*** (-2.09)	0.01084*** (-2.25)	0.00366 (-0.92)	0.67337*** (-14.88)	0.74886*** (-10.73)	0.59815*** (-10.10)	213.13***	115.15***	102.03***	0.65%	0.57%	0.74%	6.14%	6.77%	5.40%
India	0.00564 (-1.13)	0.00055 (-0.07)	0.00849 (-1.43)	0.78962*** (-10.80)	0.59681*** (-5.12)	0.98873*** (-11.13)	113.41***	26.21***	123.91***	0.57%	-0.35%	1.46%	8.48%	8.38%	8.57%
Poland	0.00526 (-0.91)	0.01573 (-1.50)	-0.00379 (-0.76)	0.71096*** (-8.45)	0.72058*** (-4.73)	0.71894*** (-9.67)	68.66***	22.42***	93.56***	0.53%	1.08%	0.07%	8.95%	10.75%	6.62%
Indonesia	0.00494 (-0.82)	0.00347 (-0.32)	0.00586 (-1.01)	0.78745*** (-8.91)	0.75247*** (-4.74)	0.81547*** (-9.46)	75.96***	22.49***	89.44***	0.50%	-0.17%	1.09%	9.56%	11.21%	7.59%
Columbia	0.00493 (-1.04)	-0.00724 (-0.98)	0.01628*** (-2.74)	0.43162*** (-6.24)	0.33934*** (-3.18)	0.51276*** (-5.80)	39.20***	10.12***	33.63***	0.50%	-0.96%	1.95%	6.84%	7.07%	6.39%
Peru	0.00434 (-1.08)	0.00131 (-0.21)	0.0058 (-1.13)	0.51444*** (-8.76)	0.44296*** (-4.80)	0.56970*** (-7.47)	72.47***	23.05***	55.73***	0.44%	-0.17%	0.93%	6.31%	6.54%	6.02%
Pakistan	0.00359 (-0.46)	-0.00085 (-0.07)	0.00701 (-0.73)	0.46288*** (-4.06)	0.53493*** (-2.93)	0.34748*** (-2.43)	15.16***	8.59***	5.91***	0.36%	-0.45%	0.92%	10.63%	12.01%	9.01%
Argentina	0.0033 (-0.54)	0.00885 (-0.85)	0.00422 (-0.70)	0.78993*** (-8.82)	1.01402*** (-6.70)	0.59031*** (-6.58)	81.50***	44.89	43.36	0.34%	0.19%	0.79%	9.65%	11.78%	6.75%
Chile	0.0001 (-0.04)	-0.00123 (-0.29)	0.00392 (-1.19)	0.45985*** (-11.38)	0.59743*** (-9.62)	0.32677*** (-6.63)	132.26	92.45***	43.97***	0.01%	-0.53%	0.60%	4.79%	5.67%	3.72%
Malaysia	-0.00165 (-0.34)	0.00279 (-0.32)	-0.00245 (-0.78)	0.66056*** (-9.43)	0.90756*** (-7.14)	0.44679*** (-8.80)	92.46***	51.01***	77.43***	-0.16%	-0.34%	0.03%	7.72%	10.13%	4.31%
Taiwan	-0.00254 (-0.59)	0.00699 (-0.97)	-0.01154*** (-2.64)	0.83599*** (-13.29)	1.00786*** (-9.67)	0.69489*** (-10.66)	177.67***	93.60***	113.59***	-0.25%	0.01%	-0.72%	8.02%	9.54%	6.13%
Philippines	-0.00256 (-0.55)	-0.00183 (-0.24)	-0.00085 (-0.16)	0.63556*** (-9.41)	0.85783*** (-7.87)	0.41319*** (-5.33)	87.64***	62.00***	28.44***	-0.25%	-0.77%	0.17%	7.44%	9.03%	5.47%
Thailand	-0.00453 (-0.70)	-0.00394 (-0.34)	-0.00248 (-0.43)	0.93898*** (-9.98)	1.10057*** (-6.50)	0.81091*** (-9.55)	101.92***	42.22***	91.16***	-0.44%	-1.15%	0.26%	10.57%	13.05%	7.51%
*, **, and *** in	dicates signif	icant at 10%,	5%, and 1%, resp	ectively.											

TA	TABLE 1: Descriptive Statistics of index returns.										
Cour		Country	Alpha								
Control	Total First Period perio		Total Period	r irst Sub- period	Second Sub- period	Second Sub- peried					
Taskey	0.03344 008	Turkey	0.03344 ^{***} (-3.15)	0.06640 ^{***} (-3.47)	0.00389 (-0.43)	10.37%					
Excision Federation	0.01905 ^{***} 0.03 (-2.39) (-3	Russian Federation	0.01905*** (-2.39)	0.03654*** (-2.56)	0.00372 (-0.54)	9.92%					
Empry	0.00953 [*] 0.0 (-1.71) (-1	Hungary	0.00953*	0.02532" (-1.71)	-0.00442 (-0.91)	6.75%					
Mexico	0.00894 ^{***} 0.01 (-2.51) (-3	Mexico	000894	0.01418	0.00598" (-1.82)	4.99%					
Brazil	0.00892 0.0 (-2.29) (-3 0.00781 0.0	Brazil	0.00892 (-2.29) 0.00781	0.01287 ^{***} (-1.95) 0.00479	0.00643 (-1.52) 0.00869	6.64%					
Cima	(-1.05) (-4 0.00645 ^{***} 0.01	China	(-1.08) 0.00648***	(-0.37) 0.01084***	(-1.20) 0.00366	5.40%					
South Africa	(-2.09) (-3 0.00564 0.0	South Africa	(-2.09)	(-2.25)	(-0.92)	8,57%					
India	(-1.13) (4 0.00536 0.0	India	(-1.13)	(-0.07)	(-1.43)	65%					
Poland	(40.51) (-1 0.00494 0.0	Poland	(-0.91)	(-1.50)	(-0.76)	7.59%					
Indonesia	(482) (4 0.00495 -0.0	Indonesia	0.00494 (-0.82)	0.00347 (-0.32)	0.00586 (-1.01)	639%					
Calualia	(-1.04) (4 0.00434 0.0	Columbia	0.00493 (-1.04)	-0.00724 (-0.98)	0.01628 (-2.74)	6.02%					
Pera	(-1.06) (-4 0.003590.0	Peru	0.00434 (-1.08)	0.00131 (-0.21)	0.0058 (-1.13)	9.00%					
Pakistan	(-0.46) (-4 0.0033 0.0	Pakistan	0.003 <i>59</i> (-0.46)	-0.00085 (-0.07)	0.00701 (-0.73)	6.75%					
Argentus	(4.54) (4 0.0001 -0.0	Argentina	0.0033 (-0.54)	0.00885 (-0.85)	0.00422 (-0.70)	3.72%					
Case .	(404) (4 -400165 0.0	Chile	0.0001 (-0.04)	-0.00123 (-0.29)	0.00392 (-1.19)	430%					
Tringe	-4.00254 0.0 (4.59) (4	Malaysia	-0,00165 (-0.34)	0.00279 (-0.32)	-0.00245 (-0.78)	6.13%					
Balanian	-4.00256 -0.0	Taiwan	-0.00254 (-0.59)	0.00699 (-0.97)	-0.071 <i>5</i> 4*** (2.64)	5.47%					
Tholand	-0.00453 -0.0 (-0.70) (4	Philippines	-0.00236 (-0.55)	-0.00183 (-0.24)	0.00085 (-0.16)	7.51%					
", ", and "" is	adicates significant a	Thailand	-0.00453	-0.00394	-0.00248						



Estimation Risk Modeling in Optimal Portfolio Selection: An Empirical Study from Emerging Markets • The first sub-period, ranging from January 1995 to December 2001, is the base window for the optimal weights of the first period. • Ex ante portfolio returns are computed and recorded for the next period, which is January 2002. Observed out of sample or ex post return in January 2002 for each country is recorded based on the optimal weights from the ex ante portfolio. Empirical The same process is repeated for the second Evidence sub-period ranges from January 2002 to December 2008. The ex post return is out of the sample observed in January 2009. 32



Monthly Excess Portfolio Return Strategy Example Example Example Mean-Variance 1.84% 2.74% 1.26% -5.43% -6.33% -1.46% AB -0.02% -0.47% 1.26% -5.43% -6.33% -1.46% AB -0.02% -0.47% -0.44% -2.31% 1.50% -2.47% REF 2.04% 2.32% 1.21% -2.84% 3.01% -1.44% CAPM -0.02% -0.36% 0.54% -2.31% 1.50% -2.20% SIM 1.94% 2.42% 1.27% -3.44% 3.01% -1.44% SIM 2.39% 2.67% 2.70% -1.07% 3.08% -3.21% BSIM 2.39% 2.67% 2.09% 3.08% -3.21% -3.44% 16.55% -3.21% Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% A37% REF 0.29% 0.25% 0.19% 1.05%	TABLE 2: Portfolio Performance of Alternative Estimation Methods							
Strategy Exerct Exerct Mean-Variance 1.84% 2.74% 1.26% -5.43% -6.38% -1.46% AB -0.02% -0.47% -0.44% -2.31% 1.50% -2.47% REF 2.04% 2.32% 1.21% -2.84% 3.01% -1.44% CAPM -0.02% -0.36% 0.54% -2.31% 1.50% -2.47% SIM 1.94% 2.42% 1.21% -2.84% 3.01% -1.44% CAPM -0.02% -0.36% 0.54% -2.31% 1.50% -2.80% SIM 1.94% 2.42% 1.27% -3.44% -4.03% 1.65% BSIM 2.39% 2.67% 2.70% -1.07% 3.08% -3.21% Memily Excess PortBalio Rit/ Ex-post Ex-post - - Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 7.73% 3.37% 1.38% CAPM	Monthly Excess Portfolio Return							
Tail Period (NP) Sp6-Period 1 (NP1) Sub/Period 2 (SR2) Total Period (TP) Sub/Period 1 (SR1) Sp6-Period 2 (NP2) Mean-Variance 1.84% 2.74% 1.26% -5.43% -6.38% -1.46% AB -0.02% -0.47% -0.44% -2.31% 1.50% -2.47% REF 2.04% 2.32% 1.21% -2.84% 3.01% -1.46% CAPM -0.02% -0.36% 0.54% -2.31% 1.50% -2.47% SIM 1.94% 2.42% 1.21% -2.84% 3.01% -1.44% Strategy Ex-ante Ex-post -4.03% 1.65% -2.80% Mamb/ Excess PortNuio Risk Ex-post Ex-post -3.21% -3.21% Mamb/ Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% SIM 9.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAP	Strategy	\sim	Exante	\sim	\sim	Examost		
Mean-Variance AB 1.84% 2.74% 1.26% -5.43% -6.38% -1.46% AB -0.02% -0.47% -0.44% -2.31% 1.50% -2.47% REF 2.04% 2.32% 1.21% -2.84% 3.01% -1.44% CAPM -0.02% -0.36% 0.54% -2.31% 1.50% -2.47% SIM 1.94% 2.42% 1.27% -3.44% 4.03% 1.65% SIM 1.94% 2.42% 2.07% -1.07% 3.08% -2.80% Strategy Ex-ante Ex-post 5.08% -3.21% 1.65% Man-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 3.21% MEF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59%		Tetal Period (NP)	Suo-Period 1 (SP1)	Sub Period 2 (SN2)	Total Period (TP)	Sub Period 1 (SP1)	Sub-Period 2 (SP2)	
AB -0.02% -0.47% -0.44% -2.31% 1.50% -2.47% REF 2.04% 2.32% 1.21% -2.84% 3.01% -1.44% CAPM -0.02% -0.36% 0.54% -2.31% 1.50% -2.47% SIM 1.94% 2.42% 1.27% -3.44% -4.03% 1.65% SIM 2.39% 2.42% 1.27% -3.44% -4.03% 1.65% Strategy Ex-ante Monthly Excess Portfulio Rist -3.08% -3.21% Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 1.05% 0.37% 1.38% CAPM 2.75% 3.39% 2.01% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 2.01% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 5.26%<	Mean-Variance	1.84%	2.74%	1.26%	-5.43%	-6.38%	-1.46%	
REF CAPM 2.04% 2.32% 1.21% -2.84% 3.01% -1.44% CAPM -0.02% -0.36% 0.54% -2.31% 1.50% -2.80% SIM 1.94% 2.42% 1.27% -3.44% -4.03% 1.65% BSIM 2.39% 2.67% 2.70% -1.07% 3.08% -2.80% Strategy Ex-ante Ex-post 3.08% -3.21% -3.21% Mamble Excess PortAlio Risk Ex-post 1.07% 3.08% -3.21% Mamble Excess PortAlio Risk Ex-post 1.07% 3.08% -3.21% Mamble Excess PortAlio Risk Ex-post 1.05% 0.08% -3.21% Mamble Excess PortAlio Risk 1.05% 0.20% 3.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.37% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 2.01% 2.75% 7.3% 3.37	AB	-0.02%	-0.47%	-0.44%	-2.31%	1.50%	-2.47%	
CAPM SIM -0.02% -0.36% 0.54% -2.31% 1.50% -2.80% SIM 1.94% 2.42% 1.27% -3.44% -4.03% 1.65% BSIM 2.39% 2.67% 2.70% -1.07% 3.08% -3.21% Strategy Ex-ante Ex-post Ex-post -3.21% -3.08% -3.21% Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% BIM 7.59% 9.22% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 2.01% 0.75% 7.3% 3.37% BIM 7.59% 9.22% 1.05% 5.96% 9.21% 10.77% 5.26% BS	REF	2.04%	2.32%	1.21%	-2.84%	3.01%	-1.44%	
SIM 1.94% 2.42% 1.27% -3.44% -4.03% 1.65% BSIM 2.39% 2.67% 2.70% -1.07% 3.08% -3.21% Strategy Ex-ante Ex-post Ex-post Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.33% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.33% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% BSIM 7.59% 9.21% 10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681	CAPM	-0.02%	-0.36%	0.54%	-2.31%	1.50%	-2.80%	
BSIM 2.39% 2.67% 2.70% -1.07% 3.08% -3.21% Monthile Excess PortAuio Risk Strategy Ex-ante Ex-post Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB	SIM	1.94%	2.42%	1.27%	-3.44%	-4.03%	1.65%	
Monthly Excess Portatio Rist Strategy Ex-ante Ex-post Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573	BSIM	2.39%	2.67%	2.70%	-1.07%	3.08%	-3.21%	
Strategy Ex-ante Ex-post Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Magnet Total Period (TP) Sub-Period 1 (SP1) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 </td <td></td> <td colspan="7">Monthly Excess Portfulio Risk</td>		Monthly Excess Portfulio Risk						
Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.037373 REF 0.2089 0.2622 0.3830 -0.3681 0.1648	Strategy	Ex-ante Ex-post						
Mean-Variance 8.84% 10.56% 4.36% 0.93% 1.37% 0.20% AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Extrategy Total Period (TP) Sub-Period 2 (SP2) Total Period 1 (SP1) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.037373 REF 0.2089 0.2622 0.3330 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015		Total Period (TP)	Sub-Period 1 (SP1)	Sub-Period 2 (SP2)	Total Period (TP)	Sub-Period 1 (SP1)	Sub-Period 2 (SP2)	
AB 2.75% 3.39% 2.01% 2.75% 7.73% 3.37% REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.96% 9.21% 0.17% 5.26% Main 9.22% 10.85% 5.96% 9.11% 10.77% 5.26% Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period 1 (SP1) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.1648 -0.9629 SIM 0.26938 0.2067 0.2113 0.3572 0.3198 0.3127	Mean-Variance	8.84%	10.56%	4.36%	0.93%	1.37%	0.20%	
REF 0.29% 0.25% 0.19% 1.05% 0.87% 1.38% CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.1648 -0.9629 SIM 0.26938 0.2067 0.2113 0.3572 0.3198 0.3127	AB	2.75%	3.39%	2.01%	2.75%	7.73%	3.37%	
CAPM 2.75% 3.39% 3.60% 2.75% 7.73% 3.37% SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.1% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Sharpe's Ratio Ex-ante Ex-post Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9273 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.26938 0.2067 0.2113 0.2572 0.3198 0.3127	REF	0.29%	0.25%	0.19%	1.05%	0.87%	1.38%	
SIM 9.22% 10.85% 5.96% 9.21% 10.77% 5.26% BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Sharpe's Ratio Ex-ante Ex-post Strategy Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9629 SIM 0.2038 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2638 0.2067 0.2113 0.3572 0.3198 0.3127	CAPM	2.75%	3.39%	3.60%	2.75%	7.73%	3.37%	
BSIM 7.59% 9.22% 5.27% 7.56% 9.18% 5.26% Sharpe's Ratio Ex-ante Ex-post Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2638 0.2067 0.2113 0.3572 0.3198 0.3127	SIM	9.22%	10.85%	5.96%	9.21%	10.77%	5.26%	
Sharpe's Ratio Sharpe's Ratio Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.33830 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2693 0.2067 0.2113 0.3572 -0.3198 0.3127	BSIM	7.59%	9.22%	5.27%	7.56%	9.18%	5.26%	
Ex-ante Ex-post Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2628 0.2067 0.2113 0.3572 0.3198 0.3127		Sharpe's Ratio						
Strategy Total Period (TP) Sub-Period 1 (SP1) Sub-Period 2 (SP2) Total Period (TP) Sub-Period 2 (SP2) Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2693 0.2067 0.2113 0.3572 0.3198 0.3127			Ex-ante			Ex-post		
Mean-Variance 0.1949 0.2189 0.2824 -10.1536 -1.5029 -10.4492 AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2693 0.2067 9.2113 0.3573 0.3198 0.3127	Strategy	Total Period (TP)	Sub-Period 1 (SP1)	Sub-Period 2 (SP2)	Total Period (TP)	Sub-Period 1 (SP1)	Sub-Period 2 (SP2)	
AB -0.0093 0.2410 0.2038 -1.1015 -1.6834 -0.3573 REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2038 0.2067 9.2113 0.3573 0.3198 0.3127*	Mean-Variance	0.1949	0.2189	0.2824	-10.1536	-1.5029	-10.4492	
REF 0.2089 0.2622 0.3830 -0.3681 0.1648 -0.9629 CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2038 0.2067 9.2113 0.3573 0.3198 0.3127*	AB	-0.0093	0.2410	0.2038	-1.1015	-1.6834	-0.3573	
CAPM -0.0075 -0.1337 0.1974 -1.1015 0.3107 -1.2359 SIM 0.2038 0.2067 0.2113 0.3573 0.3198 0.3127*	REF	0.2089	0.2622	0.3830	-0.3681	0.1648	-0.9629	
SIM 0.2038 0.2067 0.2113 0.3573 0.3198 0.3127*	CAPM	-0.0075	-0.1337	0.1974	-1.1015	0.3107	-1.2359	
	SIM	0.2038	0.2067	0.2113	0.3573	0 3198	0.3127*	
BSIM 0.3147* 0.2900' 0.5111* -0.1409* 0.3357 -0.6091	BSIM	0.3147*	0.2900*	0.5111	-0.1409*	0.3357	-0.6091	

TABLE 3: Portfolio Performance of Alternative Estimation Methods: Expected Utility						
			Expect	ed Utility		
		Total Period (TP)			Sub-Period 1 (SP1)	
Strategy	A = 0.5	A = 1	A = 2	A = 0.5	A = 1	A = 2
Mean-Variance	0.00553	0.00196	-0.00265	0.00452	0.00021	-0.00641
AB	-0.00052	-0.00076	-0.00125	-0.00546	-0.00607	-0.00691
REF	0.00445	0.00088	-0.00368	0.00239	-0.00206	-0.00820
CAPM	-0.00048	-0.00072	-0.00118	-0.00419	-0.00494	-0.00593
SIM	0.00603	-0.00149	-0.01288	0.00721	-0.00157	-0.01845
bsim <	0.06309*	0.05967*	0.05283*	0.06488*	0.06001*	0.05026*
				-		
		Expected Utility				
, I		Sub-Period 2 (SP2)				
Strategy	A = 0.5	A = 1	A = 2			
Mean-Variance	0.01683	0.01376	0.00865			
AB	0.00627	0.00577	0.00511			
REF	0.01317	0.01083	0.00669			
CAPM	0.00658	0.00594	0.00512			
SIM	0.01690	0.01350	0.00669			
BSIM	0.06736*	0.06547*	0.06170*			
* denotes the highes	st Expected Utility	given three different ris	k aversion level (A), A = 0.5,1, and 2, co	mpared among diffe	rent portfolio strategies



Introduction Model and Methodology	When estimation uncertainty is taken into account, the shrinkage Bayesian strategy incorporating single index model (BSIM) outperforms the Traditional portfolio selection strategy
Data	Allowing for asset mispricing and applying Bayesian shrinkage adjusted
Conclusion	alpha will be shrunk toward market equilibrium condition or at zero alpha value, a single factor namely excess market return is adequate in alleviating
Conclusion	estimation uncertainty.