Idiosyncratic Risk, Beta, and S&P 500 Sector Performance: 2007-2011

UNIVERSITY of DAYTON

By: Mark Kocoloski and Joe Nitting
Advisors: Dr. Robert Dean and Dr. John Rapp

The Davis Center For Portfolio Management

Purpose:

The purpose of this study is to evaluate the impact of sector idiosyncratic risk and beta market risk on sector performance in the following four time periods:

1. Overall period 2007-2010
2. Downswing Period 12/31/07 to 3/31/09
3. Upswing Period 3-31-09 to 12/31/10
4. The year 2011

Model Specifications:

Beta

$R_i = a + bR_m + e_i$
a = intercept
b = regression coefficient
R_m = return to market
E_i = error term

Idiosyncratic Risk

$$IR_i = \sqrt{\sum_{K=1}^{n} \frac{(e_K - \bar{e}_i)^2}{n}}$$

IR_i = Idiosyncratic Risk
E_k = error term "k" observations
E-bar = mean error term

Estimating Equations

$R_i = a + b(IR_i)$
$R_i = a + b(Beta)$
$R_i = a + b(Beta) + b_2(IR_i)$

Results:

IR Model

The b coefficient is significant for the long term period (2007-2010) and the upswing period, from 3/31/09 to 12/31/10. The R-squares are relatively low but coefficients have the right sign.

Beta Model

The b coefficient is significant during the downswing period, from 12/31/07 to 3/31/09, as well as for the 2011 period at a 95% confidence level. The b coefficient for the 3/31/09 to 12/31/10 period was significant at the 90% confidence level,
but indicated the wrong sign.

IR and Beta Model

The b coefficient was significant in 3 out of 4 periods. The b2 coefficient for IR was significant for 2 out of 4 periods. This b2 coefficient for IR has the right sign, but we question the sign on the b coefficient for beta in both the upswing and downswing periods. There is multi-colinearity between beta and IR in this equation, which has caused the sign change for beta.

Return Period	R Square	a	B_1 (IR)	Tstat
2007-2010	0.360	0.008	-0.307	-2.119
12/31/07 to 3/31/09	0.004	-0.038	0.079	0.174
3/31/09 to 12/31/10	0.592	0.046	-1.027	-3.406
2011	0.061	0.008	-0.210	-0.718

Return Period	R Square	a	B_1 (Beta)	Tstat
2007-2010	0.077	-0.006	0.006	0.819
12/31/07 to 3/31/09	0.524	-0.071	0.047	2.969
3/31/09 to 12/31/10	0.254	0.039	-0.021	-1.651
2011	0.795	0.025	-0.023	-5.577

Return Period	R Square	a	B_1 (Beta)	Tstat (Beta)	B_2 (IR)	Tstat (IR)
2007-2010	0.461	0.003	0.007	1.149	-0.318	-2.233
12/31/07 to 3/31/09	0.560	-.080	0.049	2.974	0.246	0.753
3/31/09 to 12/31/10	0.852	0.063	-0.021	-3.500	-1.032	-5.308
2011	0.802	0.026	-0.022	-5.116	-0.069	-0.474