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Overview

PCA was used as a tool to identify short-term global risk factors in FX by correlating factor scores with ETF returns. Output revealed two dominant categories of risk factors: regional and global risk factors.

Data Set

Risk factors were derived from 171 daily spot cross currency log returns derived from 18 major currency fixings to the Euro from January 2007 to present. PCA was computed for 6 month long rolling windows using the correlation matrix. Factor scores from the top three factors, which accounted for on average about half of the variance in FX rates, were compared to daily returns of over 1000 ETFs to find the best match

Factor Rotation

Rotated factor scores were compared to ETF returns as well due to factor instability that arises from PCA on short-term rolling windows. Two different rotations were used: Varimax rotation which aims to equalize the variance explained by each factor and an original application of the Procrustes rotation that increases stability of factor loadings throughout time.

Percentage of Windows with Strongest Correlation

	Unrotated	Varimax	Procrustes
Factor 1	36%	19%	45%
Factor 2	18%	64%	18%
Factor 3	9%	72%	19%

Average Magnitude of R

	Unrotated	Varimax	Procrustes	Best
Factor 1	0.57	0.54	0.58	0.59
Factor 2	0.44	0.50	0.42	0.52
Factor 3	0.37	0.49	0.41	0.51

By choosing between unrotated, varimax, and Procrustes factor scores for each window modest improvements in variance explained could be made relative to only looking at unrotated scores. Procrustes rotated factors tended to create the strongest matches in the leading component, while Varimax was dominant for other factors.

Results
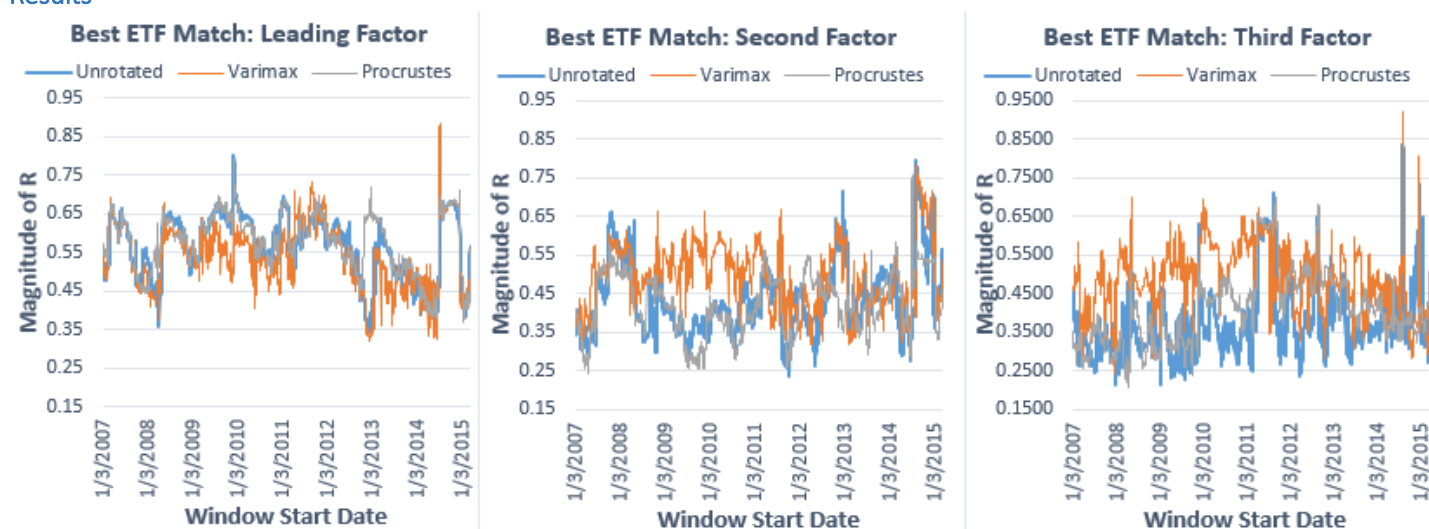
None of the PCA factors studied in this sample reach a statistically significant match for any substantial amount of time.

Frequency of ETF Matches, July 2014- Present

	Regional ETFs	Factor 1	Factor 2	Factor 3		Global ETFS	Factor 1	Factor 2	Factor 3
FXF	CURRENCYSHARES SWISS FRANC	3%	67%	50%	EMHY	ISHARES EMERGING MARKETS HIG	21%	8%	1%
FXS	CURRENCYSHARES SWEDISH KRONA	19%	5%	9%	EFFE	GLOBAL X JPM EFFICIENTE ETF	2%	2%	16%
TVIX	VELOCITYSHARES 2X VIX SH-TRM	26%	0%	0%	VWOB	VANGUARD EMERG MKTS GOV BND	2%	0%	7%
TECS	DIREXION DAILY TECH BEAR 3X	19%	0%	0%	MINT	PIMCO ENHANCED SHORT MATURIT	0%	0%	6%
ULE	PROSHARES ULTRA EURO	0%	9%	0%	JETS	US GLOBAL JETS ETF	0%	0%	4%
N/A	Other Regional	6%	8%	11%					
	Total:	**74%**	**89%**	**70%**		**Total:**	**26%**	**11%**	**34%**

Looking at windows over the past year we may observe that short-term risk factors usually point towards regional ETFs. Considerable overlap between ETF matches suggests that although PCA risk factors represent orthogonal vectors with respect to cross-currency loadings, scores generated by these risk factors are not uncorrelated and each factor may not represent a unique source of risk.

Conclusion

This methodology may add value as an unbiased and quantitative way to locate regional sources of risk (rather than hunting through news articles), although low correlations suggest that directly relying on ETFs to predict FX movements may prove costly. Follow up work to improve strength of findings could include using covariance-based factors, changing length of windows, and switching to weekly or monthly returns.