

FX Factor Carry Trade Strategy

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Introduction

- The “FX Factor Carry Trade Strategy” is an enhanced version of the naive currency carry trade strategy (referred to as “Benchmark” in this presentation).
- Instead of just going long high yielding currencies and short low yielding currencies, this strategy also uses a simple FX predictive model, in addition to yields, to generate the trading signals.
- The FX predictive model is based on 2 factors: inflation forecasts and PPP valuation.
- The FX Factor Strategy shows superior performance compared to the benchmark strategy, and higher Sharpe Ratios than investing in the Total US Equity Market.

Benchmark Carry Trade Strategy

- Create an investment universe consisting of several currencies (G10 and EM)
- Based on 3-month yield sort each currency into Low, Medium and High buckets, with an equal number of currencies in each bucket.
- Go long the High portfolio and short the low portfolio, equally weighting across currencies. Calibrate leverage to target desired excess return vol.
- Rebalance quarterly.

```
dm = [ 'EUR', 'JPY', 'GBP', 'AUD', 'CAD', 'CHF', 'SEK', 'NOK', 'NZD' ]  
em = [ 'CNY', 'KRW', 'INR', 'MXN', 'ZAR', 'BRL', 'PLN', 'THB', 'ILS', 'IDR', 'CZK', 'TRY', 'HUF', 'CLP',  
      'PHP', 'MYR', 'COP', 'RUB', 'RON', 'PEN' ]
```


FX Factor Predictive Model

- The FX Factor model forecasts FX appreciation over the next year based on 2 Factors for G10 currencies:
 - **Inflation differential:** Expected local inflation minus expected U.S. inflation
 - **Valuation:** 1/6th of initial PPP undervaluation is assumed to converge over a 1y horizon
- For EM currencies, valuation has been shown to be a weak signal, so only inflation differentials are used.

Example: British Pound Sterling Forecast

	Raw Value	Contribution to Forecast	Notes
Inflation Differential	0.3% (= 2.2% - 2.5%)	+0.3%	From IMF WEO
Valuation	-17%	+2.8%	Calculated from BIS data
Total		+3.1% p.a. appreciation	

Notes on the FX Factor Predictive Model

- The model is simple to avoid overfitting and look-ahead bias.
- The inflation forecast are sourced from a database of historical forecasts from every IMF WEO publication since 1990. Every publication (in April and November) shows forecasts for the next 6-y so 1-y ahead inflation forecasts can be calculated by interpolation at each point-in-time (quarter) for every country.
- The PPP valuation metrics have been calculated recursively at every point-in-time, using only available data at the time of trading.
- The coefficients (1 for inflation differential and 1/6 for valuation) had appeared on academic studies made before 1990, so they could have been known at the inception of the strategy.
 - Range of beta for inflation differentials on FX returns: 0.5 to 1
 - Range of time it takes for PPP valuation to converge to fair value for G10: 3 to 6 years

FX Factor Carry Trade Strategy

- **Methodology:**

1. At every quarter-end, calculate the expected total return for each currency as:

Expected total return = 3-month yield + expected 3-month spot FX return as projected by the model

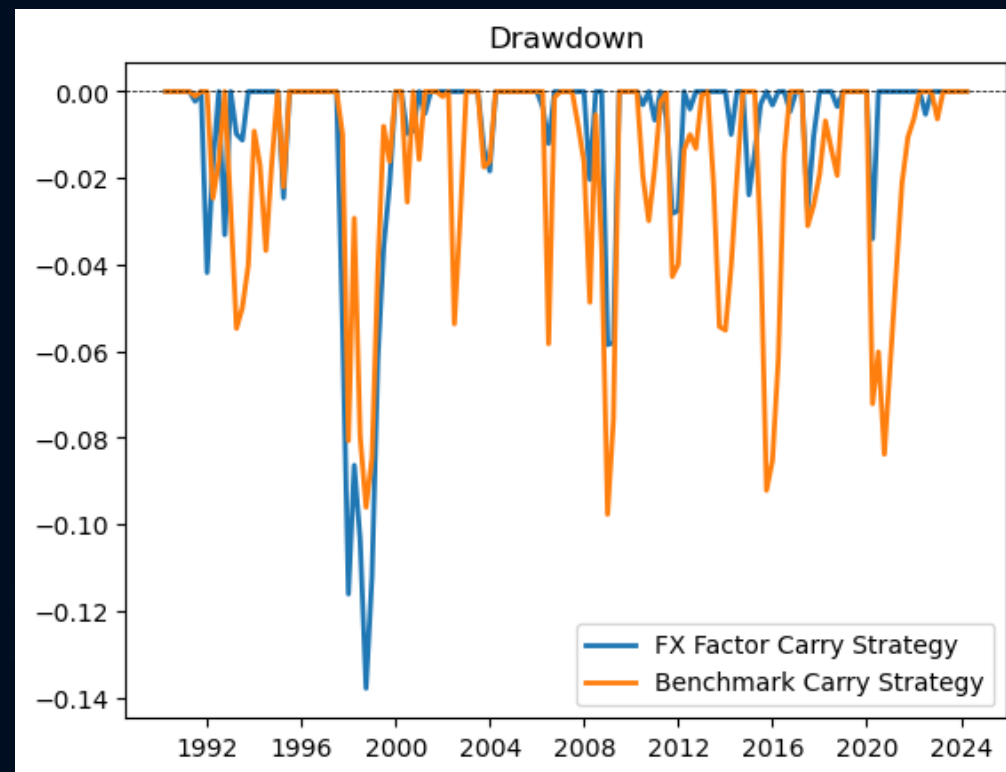
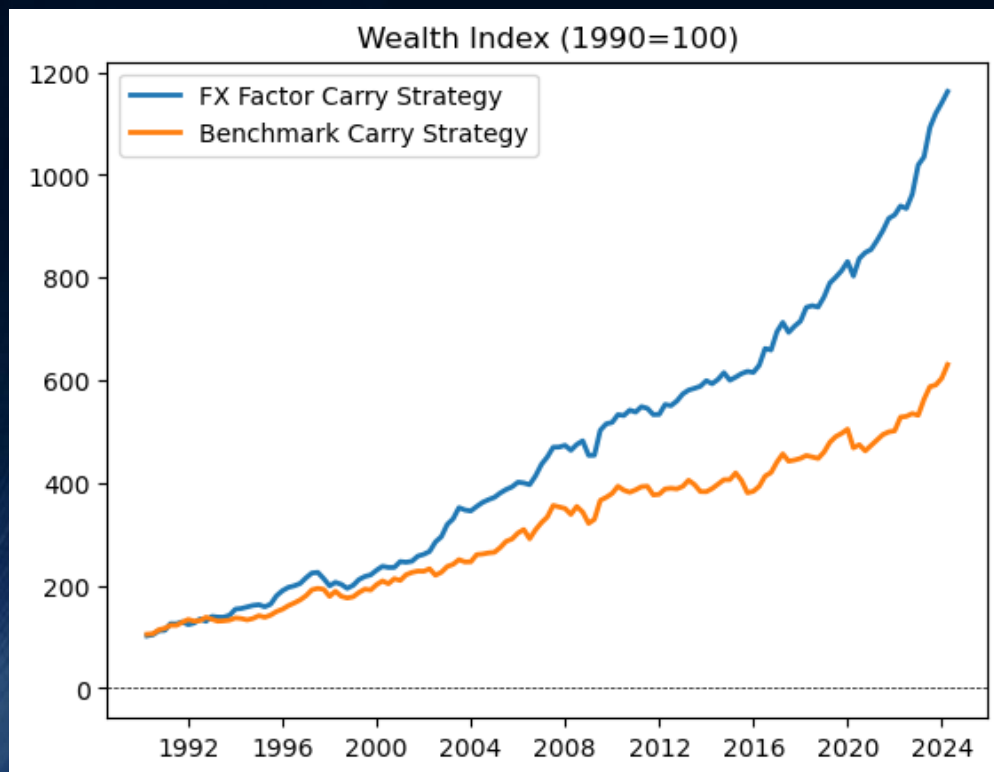
1. Based on expected total return, sort each currency into Low, Medium or High buckets, with equal number of currencies in each bucket.
2. Long-short strategy: Go long the High portfolio and short the Low portfolio, equally weighting across currencies. Calibrate leverage to target excess return vol.

- **Notes:**

- Do not hold any currency with a yield greater than 15%, which would have likely been too risky in real life. Increase the weight on other currencies in the same buckets to make up the difference.
- Total returns are calculated based on local yield + FX appreciation (not US 3m rate + 3m FX forward return). FX forwards would likely be used for long-short trading and results should be similar, although there is a small basis due to deviations from covered interest parity.
- The strategy is self-funded, so the allocation to the long and short portfolio can be chosen, and 100% of the capital can be invested in 3m US Treasuries.

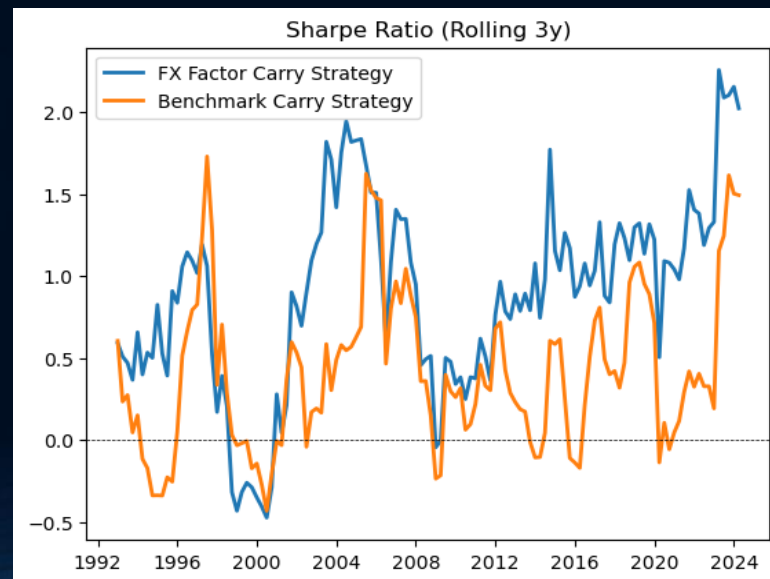
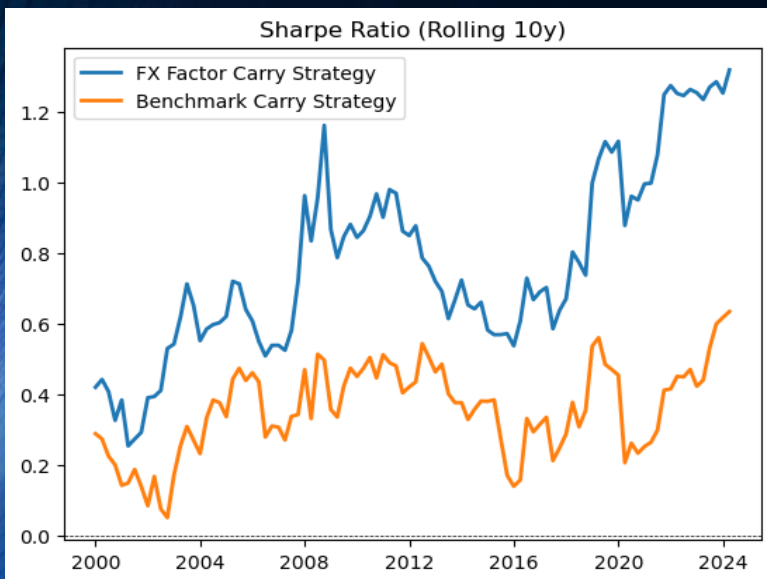
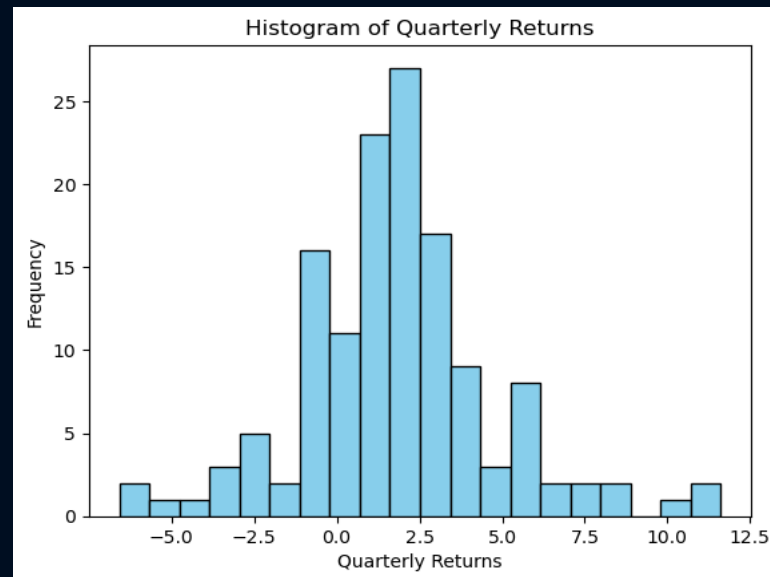
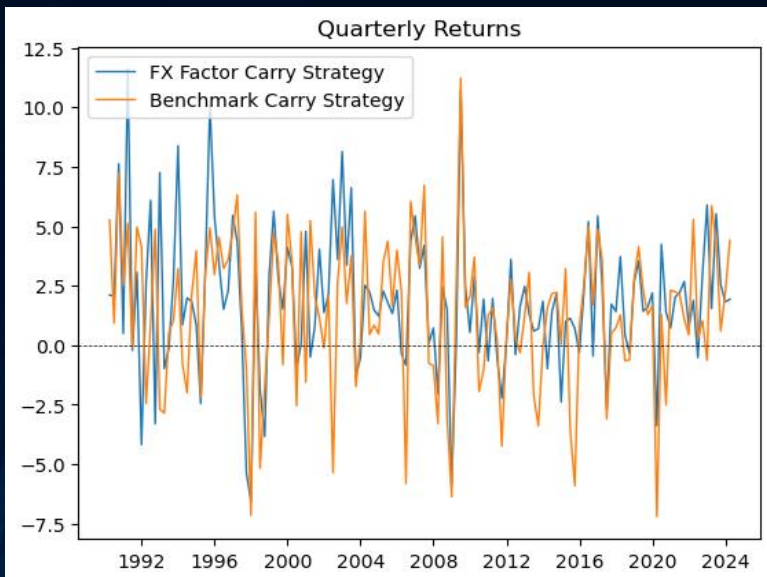
Performance of the Strategy

- Strategy Allocation: +100% High portfolio, -100% Low portfolio, +100% 3m US Treasuries



Note: The worst performance for the strategy was seen during the Asian currency crisis in 1997-1998, as there were long positions in KRW, MYR, and PHP.

Performance of the Strategy

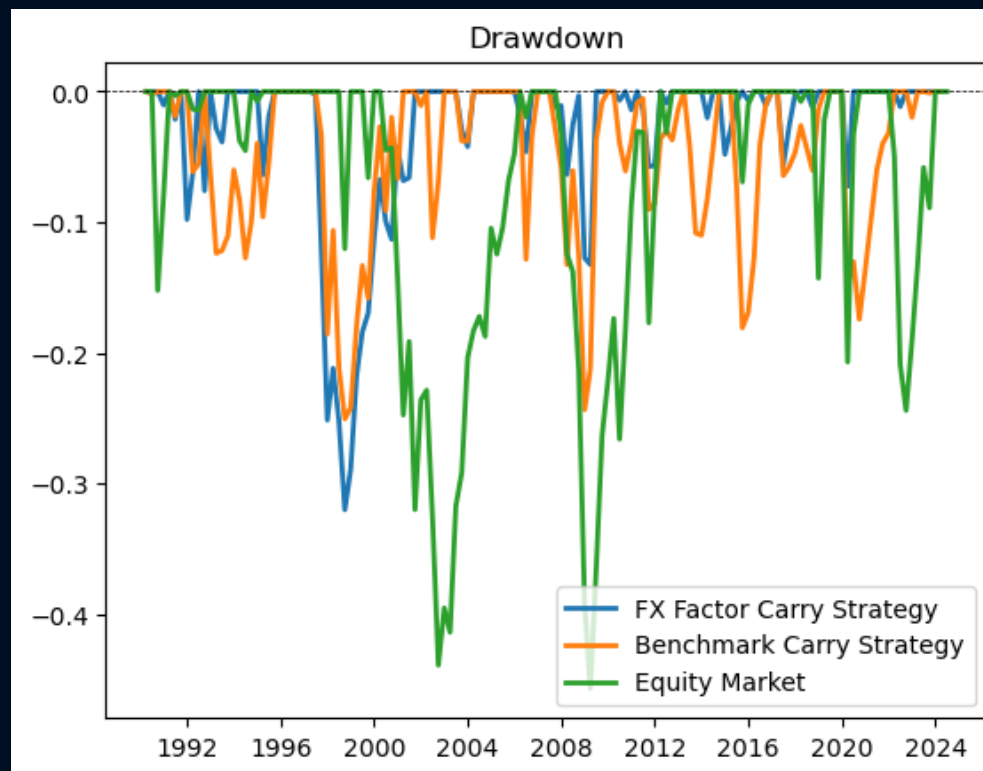
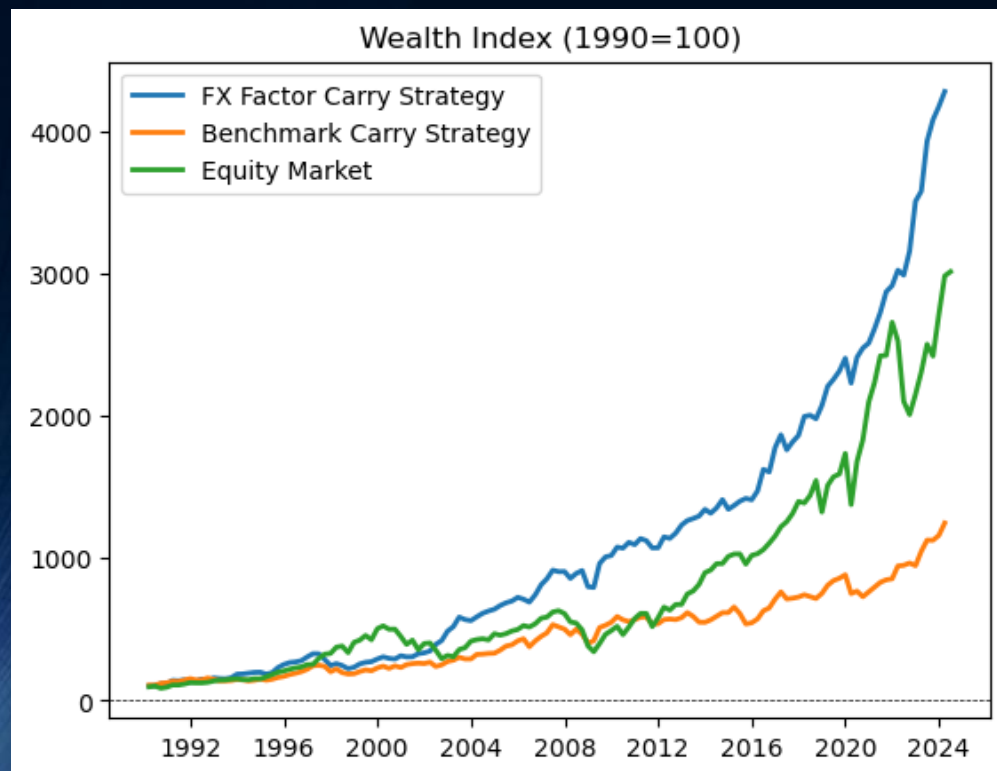


	% of Quarters			Current Position
	Long	Neutral	Short	
EUR	6%	53%	41%	Neutral
JPY	29%	32%	40%	Long
GBP	26%	60%	13%	Long
AUD	21%	38%	41%	Neutral
CAD	29%	43%	29%	Long
CHF	0%	7%	93%	Short
SEK	40%	44%	15%	Long
NOK	40%	24%	36%	Long
NZD	23%	32%	45%	Neutral
CNY	24%	47%	29%	Short
KRW	16%	70%	14%	Short
INR	26%	53%	21%	Neutral
MXN	59%	41%	0%	Long
ZAR	38%	55%	7%	Neutral
BRL	49%	51%	1%	Long
PLN	33%	49%	18%	Short
THB	2%	71%	26%	Short
ILS	27%	40%	32%	Short
IDR	42%	56%	2%	Neutral
CZK	5%	36%	59%	Neutral
TRY	8%	75%	17%	Neutral
HUF	35%	43%	21%	Neutral
CLP	22%	53%	25%	Neutral
PHP	22%	59%	19%	Neutral
MYR	7%	67%	26%	Short
COP	31%	62%	7%	Long
RUB	29%	39%	32%	Neutral
RON	24%	58%	18%	Short
PEN	24%	68%	7%	Neutral

Appendix

Increasing Leverage (x2)

- Strategy Allocation: +200% High portfolio, -200% Low portfolio, +100% 3m US Treasuries



Note: Total US Equity Market represented by the Wilshire 5000 Index

Performance Stats (since 1990)

	Benchmark Carry Strategy	FX Factor Carry Strategy	Benchmark Carry Strategy x2	FX Factor Carry Strategy x2	Total US Equity Market	3-m US Treasury
Return	5.6%	7.4%	8.2%	11.8%	11.4%	3.0%
Volatility	6.3%	5.9%	12.5%	11.7%	16.6%	1.2%
Sharpe Ratio (3y)	1.50	2.02	1.53	2.10	0.50	-
Sharpe Ratio (10y)	0.62	1.32	0.62	1.34	0.73	-
Sharpe Ratio (Full Sample)	0.41	0.74	0.42	0.75	0.51	-
Max Drawdown	-10%	-14%	-25%	-32%	-46%	-
Max Drawdown Duration (y)	2.75	2.25	3.50	4.50	5.75	-
Correlation (vs Equity)	0.35	0.25	0.35	0.25	1.00	-0.02
Beta (vs Equity)	0.13	0.09	0.27	0.18	1.00	0.00

Note: Transaction cost are not taken into account. According to research, transaction costs (from FX forwards bid-ask spread) would subtract 79bps per year from carry strategy returns (Menkhoff, Sarno, Schmeling and Schrimpf 2012).

References

- Deutsche Bank (2009). DB Currency Returns.
- Norges Bank (2014). The Currency Carry Trade.
- ECB (2020). The Predictive Power of Equilibrium Exchange Rate Models.
- Burnside, Rebelo, Eichenbaum (2008). Carry Trade: The Gains of Diversification.
- Daniel, Hodrick, Lu (2017). The Carry Trade: Risks and Drawdowns.

Data Sources

- FX rates and inflation rates – BIS
- 3m yields – FRED and BIS
- Inflation forecasts – IMF WEO