

Cross Asset Volatility

Machine Learning Based Trade Recommendations

- Our FX vol models (Figure 1, 3) show that JPY has one of the richest vol levels and that HUF has one of the cheapest. **Therefore, we recommend selling 1M ATM vol on USDJPY and buying 1M ATM vol on USDHUF.** Since Nikkei vol is also cheap (Figure 6), **we would also consider buying 3M Nikkei ATM vol and selling 3M ATM USDJPY vol.**
- Over the last few weeks we have been recommending a long position in HSCE 1Y variance and a short position in either SPX or RUT 1Y variance. The table at the end of this report shows the current PnL for those trades. We can see that the 3 pairs trades so far show a combined positive PnL of **~0.80 vol points**. This week our variance swap model (Figure 6) shows that Asia and EM indices remain attractive long vol candidates.
- Our ETF relative value model shows that XLU has one of the cheapest vol levels and XLY has one of the richest. **We recommend going long 3M ATM XLU vol and going short 3M ATM XLY vol.**

Global Quantitative and Derivatives Strategy

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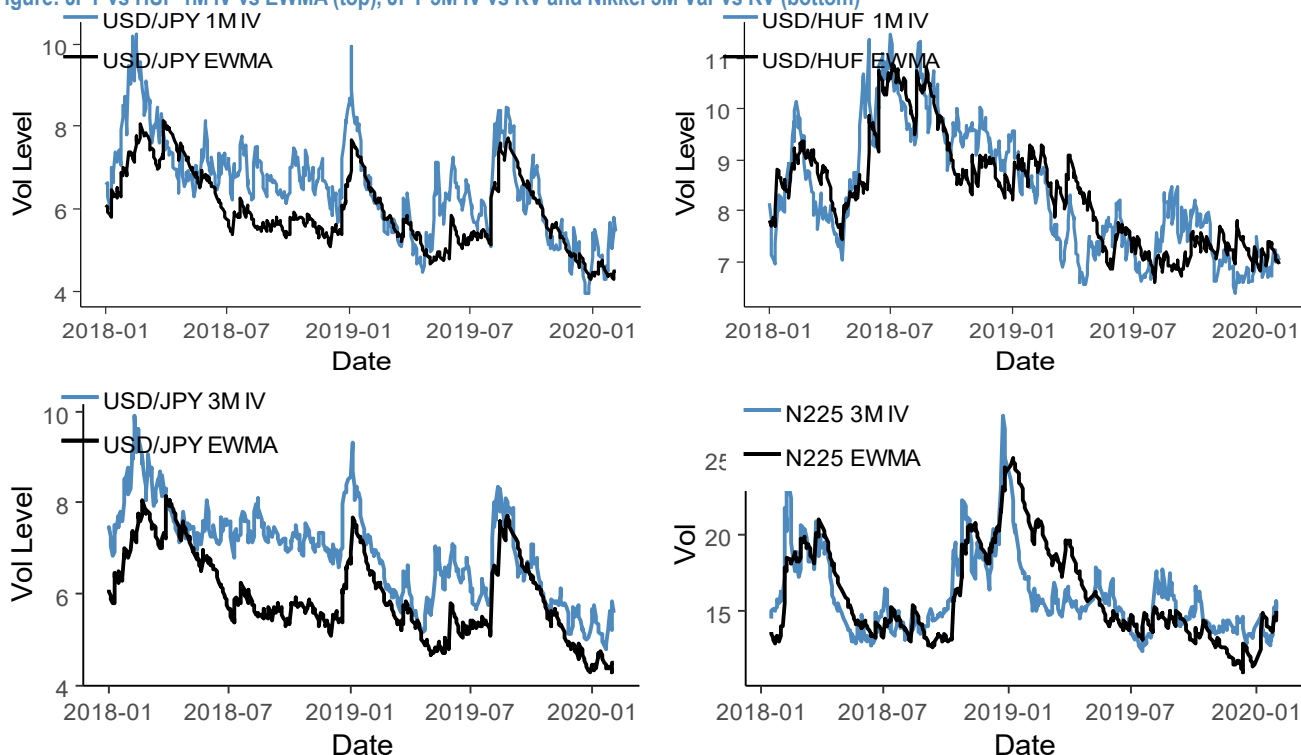
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Figure: JPY vs HUF 1M IV vs EWMA (top), JPY 3M IV vs RV and Nikkei 3M Var vs RV (bottom)



Source: J.P. Morgan.

See page 10 for analyst certification and important disclosures.

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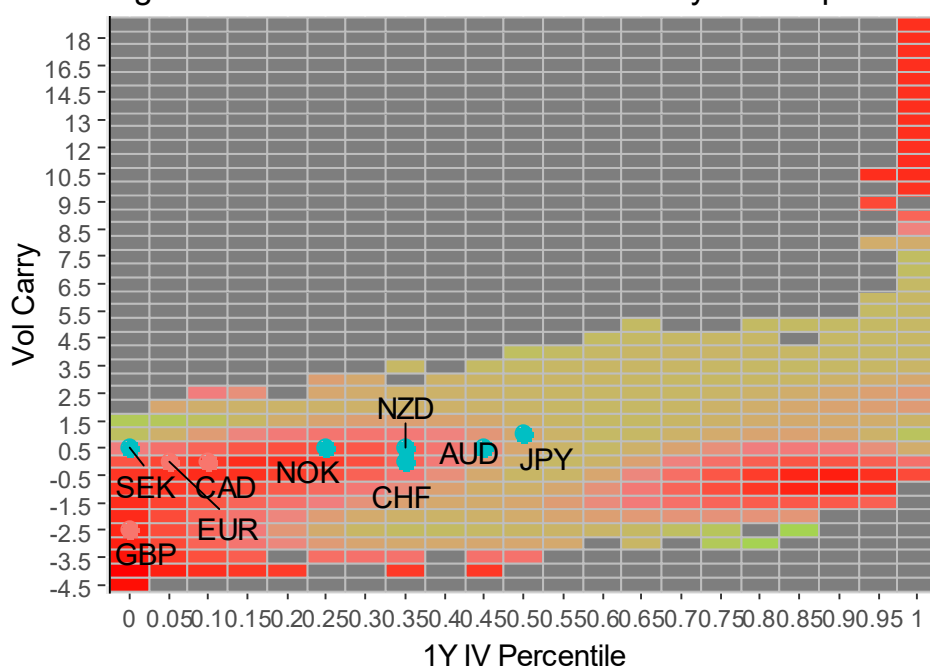
G10 FX 1M Volatility¹

Figure 1: G10 Dollar Pair FX 1M Volatility Ranking 2020-01-31

	Ccy	1M ATM Implied Vol	IV Percentile(1 yr)	Short Vol Carry	Short Vol SVM Predicted Hit Ratio	Direction
1	JPY	5.87	0.53	1.16	0.91	Rich
2	AUD	7.05	0.48	0.64	0.79	Rich
3	SEK	6.30	0.02	0.74	0.79	Rich
4	CHF	5.10	0.39	0.19	0.56	Rich
5	NOK	7.31	0.27	0.95	0.53	Rich
6	NZD	7.19	0.36	0.70	0.51	Rich
7	CAD	4.04	0.10	0.18	0.18	Cheap
8	GBP	5.93	0.04	-2.15	0.17	Cheap
9	EUR	4.07	0.08	0.06	0.16	Cheap

Source: J.P. Morgan

Figure 2: G10 Dollar Pair FX 1M Volatility Scatterplot



Source: J.P. Morgan

Green Region is Good for Selling Vol. **Red** is Good for Buying.

Direction “Rich” Means We Recommend Selling Vol.

¹ Big Data and AI Strategies: Enhancing FX volatility trading with machine learning, 13 Aug 2018

EM FX 1M Volatility²

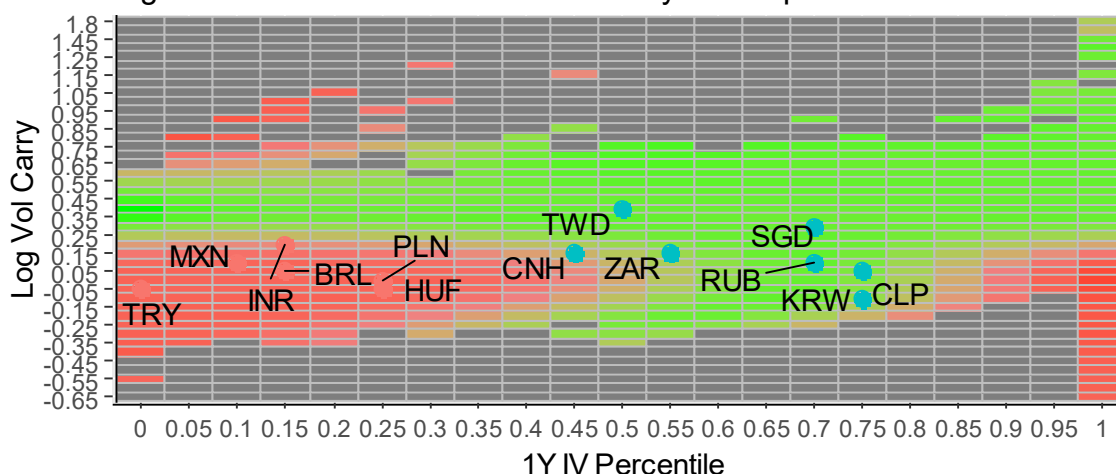
Figure 3: EM Dollar Pair FX 1M Volatility Ranking 2020-01-31

	Ccy	1M ATM Implied Vol	IV Percentile(1 yr)	Log Vol Carry	Carry	Short Vol SVM Predicted Hit Ratio	Direction
1	TWD	4.06	0.51	0.40	1.35	0.95	Rich
2	RUB	9.80	0.71	0.11	0.98	0.95	Rich
3	SGD	3.82	0.73	0.33	1.08	0.94	Rich
4	ZAR	14.49	0.59	0.20	2.60	0.91	Rich
5	KRW	7.05	0.77	0.07	0.48	0.84	Rich
6	CNH	5.08	0.50	0.18	0.85	0.76	Rich
7	CLP	10.61	0.79	-0.10	-1.10	0.67	Rich
8	INR	5.00	0.19	0.20	0.91	0.39	Cheap
9	MXN	7.55	0.15	0.13	0.92	0.11	Cheap
10	TRY	7.39	0.01	-0.05	-0.35	0.06	Cheap
11	BRL	10.87	0.18	0.08	0.82	0.05	Cheap
12	HUF	6.96	0.28	-0.03	-0.24	0.05	Cheap
13	PLN	6.22	0.26	0.04	0.25	0.05	Cheap

Source: J.P. Morgan.

Note: Log Carry = $\log(IV/EMA)$, Carry = $IV - EMA$ (see original report for details)

Figure 4: EM Dollar Pair FX 1M Volatility Scatterplot



Source: J.P. Morgan

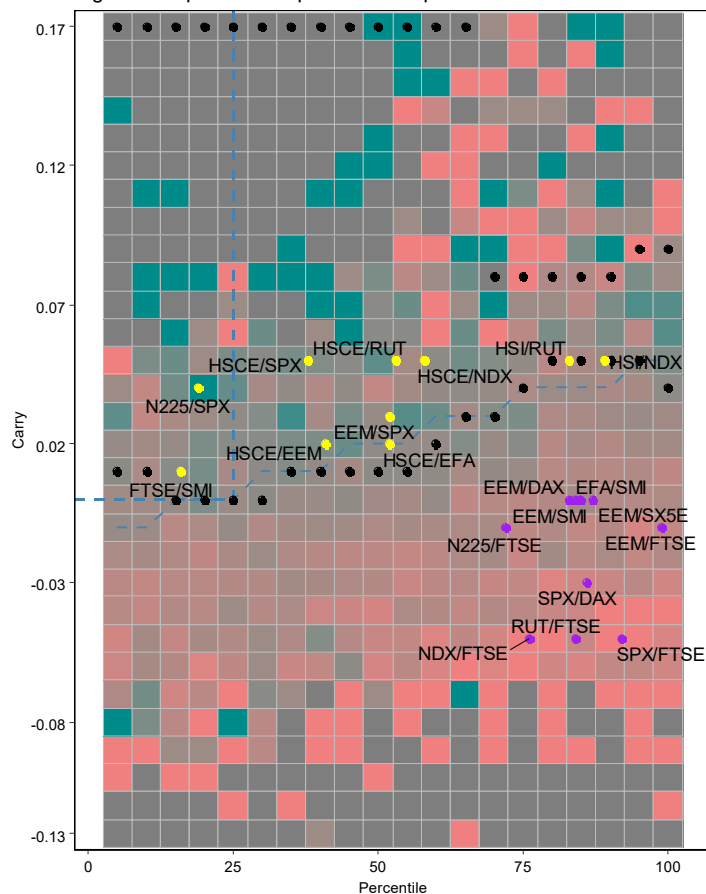
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Direction “Rich” Means We Recommend Selling Vol.

² Big Data and AI Strategies: Machine Learning to the rescue in cracking the tough EM FX volatility trading cookie, 13 Sep 2018

Equity Index 1Y Variance Swaps Relative Value³

Figure 5: Top 10 Decompression/Compression Variance Pairs 2020-01-31



Source: J.P. Morgan

Figure 6: Top 10 Variance Pairs for Decompression

	Long	Short	Carry	IV Percentile(1 Year)	Predicted Hit Ratio
1	EEM	SPX	0.03	52	0.96
2	HSCE	RUT	0.05	53	0.96
3	HSCE	NDX	0.05	58	0.94
4	HSCE	SPX	0.05	38	0.91
5	N225	SPX	0.04	19	0.90
6	HSCE	EEM	0.02	41	0.88
7	FTSE	SMI	0.01	16	0.88
8	HSCE	EFA	0.02	52	0.78
9	HSI	RUT	0.05	83	0.74
10	HSI	NDX	0.05	89	0.70

Source: J.P. Morgan

Figure 7: Top 10 Variance Pairs for Compression

	Long	Short	Carry	IV Percentile(1 Year)	Predicted Hit Ratio
1	N225	FTSE	-0.01	72	0.04
2	SPX	FTSE	-0.05	92	0.04
3	SPX	DAX	-0.03	86	0.04
4	EEM	FTSE	-0.01	99	0.04
5	EFA	SMI	0	85	0.04
6	EEM	DAX	0	83	0.04
7	EEM	SMI	0	84	0.04
8	NDX	FTSE	-0.05	76	0.04
9	RUT	FTSE	-0.05	84	0.04
10	EEM	SX5E	0	87	0.04

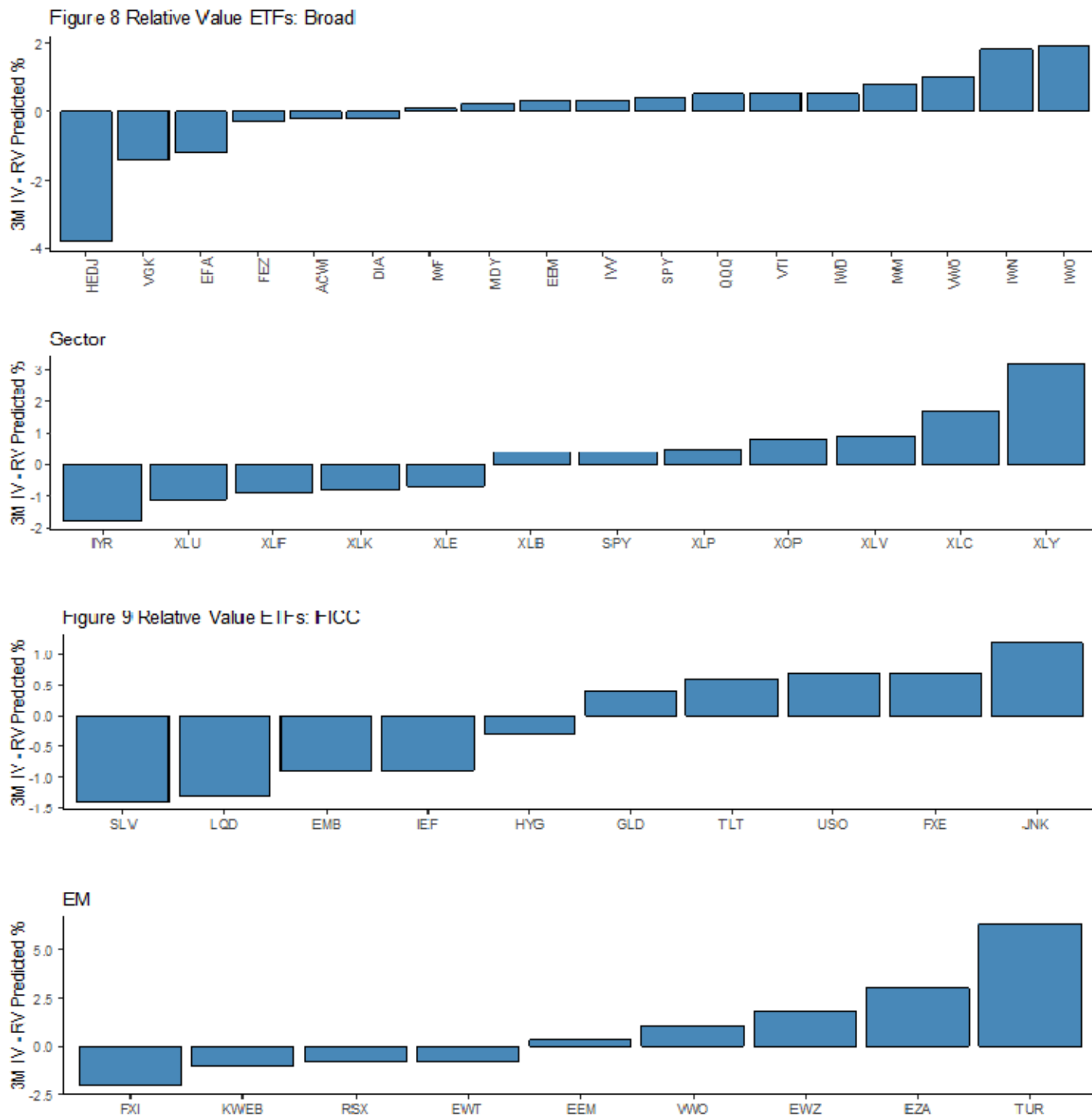
Source: J.P. Morgan

³ Global Equity Derivatives: A simple machine learning approach to variance pairs trading, 24 July 2018

Big Data and AI Strategies: Attractive long/short variance pairs in a machine learning framework, 15 Aug 2018

Big Data and AI Strategies: Application of support vector machine to cross-asset volatility pair trading, 02 Oct 2018

ETF Relative Value Volatility Rankings⁴



Source: J.P. Morgan

⁴ Global Equity Derivatives: US ETF relative value volatility model, 27 Mar 2018

Predicted P&L from Selling Gold Vol⁵

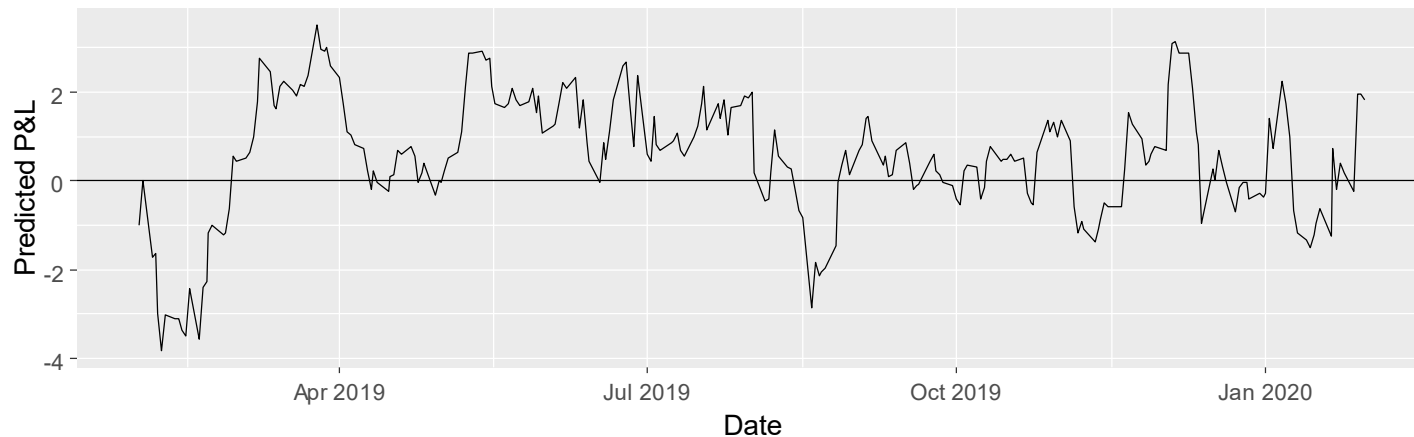
Figure 10: Gold Vol Recommendations

	Last Close Date	Expected P&L from Selling 1M Vol	Recommendation
1	2020-01-24	0.20	Sell
2	2020-01-27	-0.24	Buy
3	2020-01-28	1.97	Sell
4	2020-01-29	1.98	Sell
5	2020-01-30	1.85	Sell

Source: J.P. Morgan

*Go long volatility when expected Vol selling P&L is negative

Figure 11: Predicted PnL from Selling Gold Vol



Source: J.P. Morgan

⁵ Big Data and AI Strategies: Machine learning approach to trading gold volatility, 19 Oct 2018

VIX Term Structure Dynamic Allocation⁶

Figure 12: VIX Strategy PnL Curve



Source: J.P. Morgan

Figure 13: VIX Futures Weights

	date	February	March	April	May	June
1	2020-01-27	-0.879	-0.083	0.004	0.049	-0.081
2	2020-01-28	-0.825	-0.080	0.004	0.047	-0.135
3	2020-01-29	-0.825	-0.080	0.004	0.047	-0.136
4	2020-01-30	-0.795	-0.078	-0.002	0.020	-0.138
5	2020-01-31	-0.324	-0.084	-0.167	-0.196	-0.228

Source: J.P. Morgan

⁶ Big Data and AI Strategies: VIX Term Structure Dynamic Allocation, 08 April 2019

FX Volatility Surface Relative Value⁷

1 Month Holding Period

Positive Numbers => Positive **PnL** from going **Long** the option.

Negative Numbers => Positive **PnL** from going **Short** the option.

Figure 14: Vol Surface PnL Predictions in Basis Points 2020-01-31

	ccy	3Mp25	3Ms50	3Mc25	6Mp25	6Ms50	6Mc25	12Mp25	12Ms50	12Mc25
1	AUD-USD	-28	-20	-7	-22	-16	-9	-17	-13	-10
2	USD-CAD	-4	1	-8	-5	1	-6	-4	0	-2
3	USD-CHF	14	15	9	19	19	16	24	33	28
4	EUR-USD	-1	7	4	6	13	4	9	15	4
5	GBP-USD	-13	-11	-7	-13	-11	-5	-11	-11	-3
6	USD-JPY	-31	-34	-25	-27	-29	-24	-21	-28	-20
7	USD-NOK	10	23	-1	13	22	6	9	21	14
8	NZD-USD	-36	-30	-7	-30	-26	-10	-30	-27	-10
9	USD-SEK	-3	-18	-19	-8	-23	-20	-13	-28	-20

Source: J.P. Morgan

⁷ Big Data and AI Strategies: Relative Value Trading on FX Volatility Surfaces, 02 July 2019

Recent Trades

Open Date	Mark Date	Vol Position	Direction	Type	P&L (vols)	Maturity	Status
2020-01-28	2020-01-31	USD/SEK	Short	FX Vol	0.55	1M	Active
2020-01-28	2020-01-31	AUD/USD	Long	FX Vol	0.27	1M	Active
2020-01-28	2020-01-31	SPX	Short	Var Swap	-0.80	12M	Active
2020-01-28	2020-01-31	HSCE	Long	Var Swap	0.67	12M	Active
2020-01-28	2020-01-31	SLV	Long	Rel Value	1.91	3M	Active
2020-01-28	2020-01-31	GLD	Short	Rel Value	-0.44	3M	Active
2020-01-22	2020-01-31	RUT	Short	Var Swap	-1.21	12M	Active
2020-01-22	2020-01-31	HSCE	Long	Var Swap	1.66	12M	Active
2020-01-22	2020-01-31	LQD	Long	Rel Value	0.01	3M	Active
2020-01-22	2020-01-31	TLT	Short	Rel Value	-2.04	3M	Active
2020-01-22	2020-01-31	USD/TWD	Short	FX Vol	-1.18	1M	Active
2020-01-22	2020-01-31	USD/CNH	Long	FX Vol	0.91	1M	Active
2020-01-07	2020-01-31	XLE	Long	Rel Value	2.45	3M	Active
2020-01-07	2020-01-31	XOP	Short	Rel Value	-3.35	3M	Active
2020-01-07	2020-01-31	USD/BRL	Long	FX Vol	-0.03	1M	Active
2020-01-07	2020-01-31	USD/TRY	Short	FX Vol	3.04	1M	Active
2020-01-07	2020-01-31	HSCE	Long	Var Swap	0.81	12M	Active
2020-01-07	2020-01-31	SPX	Short	Var Swap	-0.28	12M	Active
2019-12-03	2020-01-31	EEM	Short	Rel Value	-1.62	3M	Active
2019-12-03	2020-01-31	EM FX Vol Basket	Long	FX Vol	-0.47	3M	Active
2019-11-26	2020-01-31	XLE	Long	Rel Value	-0.82	3M	Active
2019-11-26	2020-01-31	XLY	Short	Rel Value	1.35	3M	Active
2019-12-17	2020-01-16	USD/CLP	Long	FX Vol	-1.75	1M	Expired
2019-12-17	2020-01-16	USD/TWD	Short	FX Vol	0.21	1M	Expired
2019-12-10	2020-01-09	XAU/USD	Short	FX Vol	-0.80	1M	Expired
2019-12-10	2020-01-09	USD/CNH	Short	FX Vol	1.25	1M	Expired
2019-12-10	2020-01-09	USD/TWD	Short	FX Vol	-0.01	1M	Expired
2019-11-26	2019-12-26	XAU/USD	Short	FX Vol	-0.63	1M	Expired

Source: J.P. Morgan.

Risks of Common Option Strategies

Risks to Strategies: Not all option strategies are suitable for investors; certain strategies may expose investors to significant potential losses. We have summarized the risks of selected derivative strategies. For additional risk information, please call your sales representative for a copy of “Characteristics and Risks of Standardized Options.” We advise investors to consult their tax advisors and legal counsel about the tax implications of these strategies. Please also refer to option risk disclosure documents.

Put Sale: Investors who sell put options will own the underlying asset if the asset’s price falls below the strike price of the put option. Investors, therefore, will be exposed to any decline in the underlying asset’s price below the strike potentially to zero, and they will not participate in any price appreciation in the underlying asset if the option expires unexercised.

Call Sale: Investors who sell uncovered call options have exposure on the upside that is theoretically unlimited.

Call Overwrite or Buywrite: Investors who sell call options against a long position in the underlying asset give up any appreciation in the underlying asset’s price above the strike price of the call option, and they remain exposed to the downside of the underlying asset in the return for the receipt of the option premium.

Booster : In a sell-off, the maximum realized downside potential of a double-up booster is the net premium paid. In a rally, option losses are potentially unlimited as the investor is net short a call. When overlaid onto a long position in the underlying asset, upside losses are capped (as for a covered call), but downside losses are not.

Collar: Locks in the amount that can be realized at maturity to a range defined by the put and call strike. If the collar is not costless, investors risk losing 100% of the premium paid. Since investors are selling a call option, they give up any price appreciation in the underlying asset above the strike price of the call option.

Call Purchase: Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset’s price is below the strike price of the call option.

Put Purchase: Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset’s price is above the strike price of the put option.

Straddle or Strangle: The seller of a straddle or strangle is exposed to increases in the underlying asset’s price above the call strike and declines in the underlying asset’s price below the put strike. Since exposure on the upside is theoretically unlimited, investors who also own the underlying asset would have limited losses should the underlying asset rally. Covered writers are exposed to declines in the underlying asset position as well as any additional exposure should the underlying asset decline below the strike price of the put option. Having sold a covered call option, the investor gives up all appreciation in the underlying asset above the strike price of the call option.

Put Spread: The buyer of a put spread risks losing 100% of the premium paid. The buyer of higher-ratio put spread has unlimited downside below the lower strike (down to zero), dependent on the number of lower-struck puts sold. The maximum gain is limited to the spread between the two put strikes, when the underlying is at the lower strike. Investors who own the underlying asset will have downside protection between the higher-strike put and the lower-strike put. However, should the underlying asset’s price fall below the strike price of the lower-strike put, investors regain exposure to the underlying asset, and this exposure is multiplied by the number of puts sold.

Call Spread: The buyer risks losing 100% of the premium paid. The gain is limited to the spread between the two strike prices. The seller of a call spread risks losing an amount equal to the spread between the two call strikes less the net premium received. By selling a covered call spread, the investor remains exposed to the downside of the underlying asset and gives up the spread between the two call strikes should the underlying asset rally.

Butterfly Spread: A butterfly spread consists of two spreads established simultaneously – one a bull spread and the other a bear spread. The resulting position is neutral, that is, the investor will profit if the underlying is stable. Butterfly spreads are established at a net debit. The maximum profit will occur at the middle strike price; the maximum loss is the net debit.

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