Discussion of

Are Intermediary Contraints Priced?

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Intermediary Constraints and Asset Prices

- Are intermediary constraints priced?
- Important question for asset pricing and for policy makers.
- Previous approaches
  1. Broker-dealer leverage, capital ratio, or strength of dollar as a proxy (Adrian et al. (2014), He et al. (2017), Avdjiev et al. (2018))
  2. Return differential between low-beta and high-beta stocks (Frazzini and Pedersen (2009))
  3. Measures of market dislocation (Hu et al. (2013), Pasquariello (2014))
- This paper: Infer tightness of intermediary constraints from cross-currency covered interest parity (CIP) basis.

Motivation: Basis Shock as an SDF Shock

- Intermediary with time-separable utility U, time discount δ, wealth W_t, consumption C_t

- Faces a time-varying regulatory capital constraint with tightness k_t for all asset positions $\{D_{i,t}\}$:

$$k_t \sum_i |D_{i,t}| \leq W_t - C_t.$$

- Value function:[1]

$$V(W_t, k_t) = \max_{\{D_{i,t}\}, C_t} U(C_t) + E_t\left[e^{-\delta} V(W_{t+1}, k_{t+1})\right] + \lambda_t \left(W_t - C_t - k_t \sum_i |D_{i,t}|\right)$$

where $W_{t+1} = \sum_i (1 + R_{i,t+1}) D_{i,t}$.

- Intermediary optimality (FOCs + envelope theorem):

$$E_t\left[(1 + R_{i,t+1}) e^{-\delta} \frac{V'(W_{t+1}, k_{t+1})}{V'(W_t, k_t)}\right] \leq \text{sign}(D_{i,t}) k_t$$

[1] To keep things simple, let's assume wealth not saved as asset positions evaporate.

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Motivation: Basis Shock as an SDF Shock

- With joint log normality,

$$\underbrace{E_t\left[r_{i,t+1}\right] + \frac{1}{2}\sigma_{i,t}^2 - r_{f,t+1}}_{\text{expected excess return}} \leq \underbrace{-\sigma_{i,m,t}}_{\text{risk premium}} + \underbrace{k_t}_{\text{basis}}$$

  where $\sigma_{i,m,t} = Cov_t\left(r_{i,t+1}, m_{t+1}\right)$ and $m_t = \log\left(e^{-\delta}\frac{V'(W_t,k_t)}{V'\left(W_{t-1},k_{t-1}\right)}\right)$.

- In general, we expect $m_t\left(\overset{+}{k_t}\right)$. (Tighter constraint, higher MVW.)

- The pricing equation holds with equality for intermediary long positions. Holds with basis $-k_t$ for intermediary short positions.

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where $\sigma_{i,m,t}=Cov_t\left(r_{i,t+1},m_{t+1}\right)$ and we expect $m_t\left(\overset{+}{k_t}\right)$.

Implications:

1. Basis proxies for tightness of regulatory constraints
2. Parity trades that intermediaries engage in earn a basis k_t
   - Presumably, CIP basis can proxy for k_t whereas less profitable parity trades may not proxy for k_t.
3. Trades with a negative k_t exposure earn a risk premium
   - Forward CIP arbitrage is exposed to CIP basis
4. Shocks to k_t is a risk factor that prices assets traded by intermediaries
   - Use forward CIP arb return as the risk factor

Comment 1: Why CIP Basis?

- Neat insight that one can use intermediary-traded basis as a risk factor.
- But why is CIP basis more special than other spreads out there? (e.g., on-the-run vs. off-the-run, swap spread, etc.)
- Anecdotally, large banks do (indirectly) trade on CIP basis, so perhaps it's a better proxy for constraints faced by banks?
  - Want more justification for the focus on CIP basis. Or show that other spreads, at least the ones traded by intermediaries, give you similar results.
- Also, carry trades in practice are not a textbook arbitrage since you need funding for margins on interest rate swap and FX forwards; it's still exposed to funding risk.
  - Perhaps it's fine so long as intermediaries treat it as near arbitrage.
  - Or could argue funding risk is also uniquely faced by intermediaries.

Comment 2: Forward CIP Profit and Basis Risk

- Much of the paper focuses on forward CIP trades. Some review..
- For bonds, forward rate from $t+h$ to $t+h+1$, quoted at t:

$$f_{t,h} = \log\left(\frac{P_{t,h}}{P_{t,h+1}}\right) = p_{t,h} - p_{t,h+1} = (h+1)\, y_{t,h+1} - h y_{t,h}$$

  And imagine a trade that goes long $f_{t,h}$ today and short $y_{t+h,1}$ at $t+h$ to unwind future cash flow. Profit:

$$f_{t,h} - y_{t+h,1}$$

- Now CIP spot basis $x^c_{t,h}$ is like yield $y_{t,h}$. So forward CIP basis quoted at t (ignoring the annualized unit issue):

$$f^c_{t,h} = (h+1)\, x^c_{t,h+1} - h x^c_{t,h}$$

  And profit from forward CIP trade that unwinds the CFs from $t+h$:

$$f^c_{t,h} - x^c_{t+h,1}$$

Comment 2: Forward CIP Profit and Basis Risk

Profit from forward CIP trade:

$$f^c_{t,h,\tau} - x^c_{t+h,\tau}$$

- Profit negatively exposed to CIP basis shock $x^c_{t+h,\tau}$ $\implies$ risk premium $+$
- The paper finds average profit from AUD-JPN forward CIP trade to be positive and uses it as evidence that intermediary constraints are priced:

Table 1: Portfolio Returns on OIS 1M-forward 3M Forward CIP Trading Strategy

	Mean (bps)			Sharpe Ratio		
	Pre-Crisis	Crisis	Post-Crisis	Pre-Crisis	Crisis	Post-Crisis
Carry	2.44	-4.37	14.25***	0.61	-0.16	1.38***
s.e.	(1.34)	(10.79)	(3.26)	(0.34)	(0.38)	(0.33)
Dollar	-1.46	6.16	0.07	-0.68*	0.18	0.02
s.e.	(0.77)	(16.53)	(1.52)	(0.34)	(0.44)	(0.33)

Comment 2: Forward CIP Profit and Basis Risk

- But in practice, forward CIP trade also requires margin (or makes regulatory constraint more binding). Hence:
  1. Intermediaries who trade it would require margin premium (Recall $E_t\left[r_{i,t+1}\right] + \frac{1}{2}\sigma_{i,t}^2 - r_{f,t+1} = -\sigma_{i,m,t} + k_t$)
  2. May also require premium for funding/roll-over risk
- Can you argue that these other premia are small?
- Cross-sectional results help since if margin premium and funding risk are similar across test assets, these premia would be captured by the intercept.

Comment 3: Cross-Sectional Results

- Forward CIP profit helps price the cross-section of bond, FX, forward CIP returns.

	US	Sov	FX	FF	US/Sov/FX	Forward Arb
Int. Equity	0.377	1.362	1.843***	0.599	1.277*	0.0936
	(0.918)	(0.783)	(0.427)	(0.558)	(0.511)	(0.970)
Basis Shock	-0.169*	-0.0784	-0.0719	0.0271	-0.0971*	-0.0487**
	(0.0754)	(0.0501)	(0.0466)	(0.0629)	(0.0380)	(0.0153)
Intercepts	Yes	Yes	Yes	Yes	Yes	Yes
N (assets)	20	6	11	25	37	10
N (beta)	98	98	98	98		98
N (mean)	234	283	418	1106		98

- If U is CRRA, $E_t\left[r_{i,t+1}\right] + \frac{1}{2}\sigma_{i,t}^2 - r_{f,t+1} = \gamma\sigma_{i,w} + (\gamma - 1)\,\sigma_{i,h} + k_t$, where $\sigma_{i,w}$ and $\sigma_{i,h}$ are covariances with wealth portfolio return and investment opportunity.
- What kind of risk are basis shocks? If they covary negatively with intermediary wealth return, negative price of risk makes sense.
- But if int. equity return perfectly captures wealth return, the result implies that $\gamma < 1$ (EIS > 1) and that times of high basis are times of good investment opportunity.

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- But to me, the $\sigma_{i,w}$ vs. $\sigma_{i,h}$ distinction unimportant. Since short-run volatility in the basis likely driven by supply reasons (e.g., intermediary capital, regulatory shocks), high k_t times likely to be high m_t times, even after controlling for the int. equity return proxy.
  - Out of curiosity, do results change if you exclude int. equity?
- If you want to separate out the investment opportunity part, perhaps use CFTC data and/or a narrative approach to identify demand-driven (e.g., hedging needs) CIP basis shocks and decompose the CIP factor into two. See if demand-driven basis shock earn a different risk premium.

Comment 4: Cross-Sectional Test

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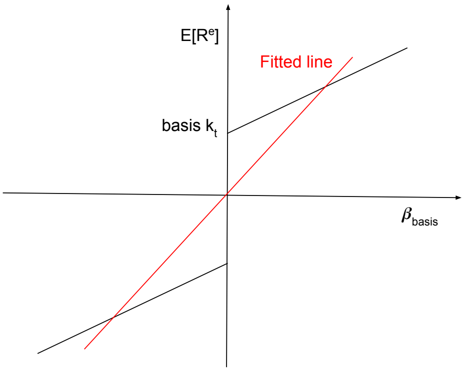
- In an intermediary-based model, many things can go wrong with standard asset pricing tests (largely ignored in the literature).

Comment 4: Cross-Sectional Test

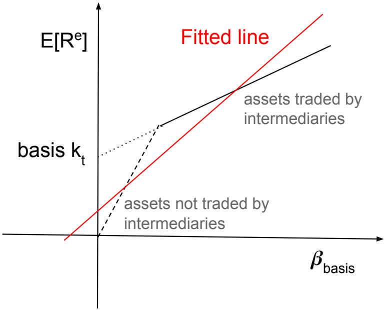
- Problem 1: Assets that intermediaries take long and short positions on earn positive and negative basis.
  - Fitting a line through it leads to an inflated price of risk



- Simple suggstion: Try using two intercepts, using the restriction that they equal in absolute value. Or plot the results and show this is not an issue.

Comment 4: Cross-Sectional Test

- Problem 2: Some of the test assets are not actively traded by intermediaries (e.g., CAD-USD). These assets are also less likely to be exposed to basis shocks (Brunnermeier and Pedersen (2009), Kondor and Vayanos (2019), Cho (2018)).
  - Again inflates the estimated price of risk



- Suggstion: Exclude assets not traded by intermediaries and re-run the tests to see if price of risk estimate changes significantly.

Other Comments

- The microfoundation for an intermediary (households investing through intermediaries) is neat, but modeling an intermediary as just another investor seems to deliver similar predictions.
  - Since SDF + basis of any investor whose FOC binds prices assets.
  - Emphasize if the microfoundation delivers important new insights
- Economic/policy interpretation of the price of risk associated with CIP basis?

Conclusion

- New approach to understanding intermediary constraints
- Want better justification for the focus on CIP basis
- Cross-sectional tests of intermediary-based models tricky since standard implementation can bias the price of risk estimate
  - (Unless we assume intermediaries trade all assets as in He and Krishnmaurthy (2013))
  - Room for methodological contribution