Discussion of
Are Intermediary Constraints Priced?
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Fall 2019 MFS Meeting
Consider the **forward CIP strategy**: trading strategy that bets on **shrinking** CIP deviations.

Here, focus on the **carry forward CIP strategy** that effectively bets on the JPY-AUD CIP deviations shrinking. Post-crisis, its average annualized return is 14.27 bps and its SR is 1.38.

This suggests that shrinking (widening) arbitrage opportunities is “good (bad) shock”.

Propose and test an IAP model with SDF

\[
\frac{d\Lambda_t}{\Lambda_t} = -\gamma \frac{dW_t^I}{W_t^I} + \xi \frac{d|x_t|}{|x_t|}
\]
Intermediary Asset Pricing

IAP is about how *intermediation frictions* affect asset prices.

IAP model ingredients:

- Two sectors: intermediaries and households
- Limited direct participation of (some) households in (some) asset markets
- Agency friction between intermediary managers and households
Intermediary Asset Pricing

If the agency constraint is **not binding**, intermediaries are a veil: both intermediary and household SDFs are valid for pricing assets.

If the agency constraint is **binding**, asset prices satisfy intermediary SDF, but not (constrained) household SDF. The valuation wedge will be higher

- time-series: when the constraint is tighter
- cross-section: for more intermediated assets

The intermediary SDF having pricing power is a necessary, but not sufficient condition for IAP.
Intermediary (manager) has EZ preferences, with risk aversion parameter $\gamma$ and IES parameter $\psi$. Chooses $C_t$ and $\alpha^i_t$.

Agency friction generates IC/equity constraint (EC): $\frac{N^M_t}{N_t} \geq \frac{1}{c_t}$

Regulatory constraint (RC): $\sum_i k^i |\alpha^i_t| \leq 1$
Intermediary SDF: Derivation

Ignoring $dt$ terms, the intermediary SDF is

$$\frac{d\Lambda_t}{\Lambda_t} = -\frac{\theta}{\psi} \frac{dC_t}{C_t} - (1 - \theta) \frac{dW_t^I}{W_t^I}$$

and using the approximation

$$\frac{dC_t}{C_t} \approx \frac{dW_t^I}{W_t^I} + (1 - \psi)dz_t$$

we get

$$\frac{d\Lambda_t}{\Lambda_t} \approx -\gamma \frac{dW_t^I}{W_t^I} + (1 - \gamma)dz_t$$

If, further, $\frac{d|x_t|}{|x_t|} = \theta dz_t$, with $\theta > 0$, then

$$\frac{d\Lambda_t}{\Lambda_t} \approx -\gamma \frac{dW_t^I}{W_t^I} + \frac{1 - \gamma}{\theta} \frac{d|x_t|}{|x_t|}$$
Intermediary SDF: Intuition

\[
\frac{d\Lambda_t}{\Lambda_t} \approx -\gamma \frac{dW_t^I}{W_t^I} + \frac{1 - \gamma}{\theta} \frac{d|x_t|}{|x_t|} = -\gamma dR_t^{W,I} + \xi dR_t^{x|}\]

Consider a trading strategy that gains when the basis increases.

- If \( \gamma > 1 \), then \( \xi < 0 \): states with good investment opportunities have low state price, so risky strategy.

- If \( \gamma < 1 \), then \( \xi > 0 \): states with good investment opportunities have high state price, so hedging strategy.

Here, minus forward CIP strategy has \( rp < 0 \) \( \implies \) \( \gamma < 1, \xi > 0 \).

Indeed,

\[
\begin{bmatrix}
\gamma \\
\xi
\end{bmatrix} = \Sigma^{-1} \lambda = \begin{bmatrix}
0.66 \\
305
\end{bmatrix}
\]
Where does the result $\frac{d|x_t|}{|x_t|} = \theta dz_t$ come from?

The exp. excess return of intermediated asset $i$ is

$$E_t(dR_{t}^{e,i}) = -\text{cov}_t\left(dR_i, \frac{d\Lambda_t}{\Lambda_t}\right) + \text{sgn}(\alpha_t^i)k^i \frac{|x_t|}{k_c} dt$$

and the exp. excess return of the intermediary wealth portfolio is

$$E_t(dR_{t}^{e,W,I}) = -\text{cov}_t\left(dR_{t}^{W,I}, \frac{d\Lambda_t}{\Lambda_t}\right) + \frac{|x_t|}{k_c} dt$$

so investment opportunities are better when $|x_t|$ is higher.
What is the economic content of $\frac{d|x_t|}{|x_t|}$? In the model, arbitrage opportunities increase when intermediaries are more constrained:

$$\frac{d|x_t|}{|x_t|} \approx \phi d\lambda_t^{RC},$$

so shocks in arb. bases reflect shocks in RC tightness.

Then, we can write

$$\frac{d\Lambda_t}{\Lambda_t} = -\gamma \frac{dW_t^I}{W_t^I} + (1 - \gamma)\frac{\phi}{\theta} d\lambda_t^{RC},$$

Are intermediary constraints priced? Authors: Yes.
Intermediary SDF: Priced Intermediary Constraints

What happens in high $\lambda_t^{RC}$ states?

The constraint improves the risk-return trade-off for all assets, so the intermediary’s investment opportunities improve.

However (unless knife-edge case for regulatory weights $k^i$), the RC will have a heterogeneous impact on assets. Distortionary effects in intermediary portfolio holdings and/or relative asset prices.
Recall the intermediary SDF in He, Kelly and Manela (2017):

\[
\frac{d\Lambda_t}{\Lambda_t} = -\gamma \frac{dC_t}{C_t} \approx -\gamma \frac{dW^I_t}{W^I_t} = -\gamma \frac{dW_t}{W_t} - \gamma \frac{d\eta_t}{\eta_t},
\]

where we have used \( C_t \approx \beta W^I_t \) and \( W^I_t = \eta_t W_t \).

This paper:

\[
\frac{d\Lambda_t}{\Lambda_t} = -\gamma \frac{dW_t}{W^I_t} + \frac{1 - \gamma}{\theta} \frac{d|x_t|}{|x_t|} = -\gamma \frac{dW_t}{W_t} - \gamma \frac{d\eta_t}{\eta_t} + \frac{1 - \gamma}{\theta} \frac{d|x_t|}{|x_t|},
\]
Intermediary SDF: Comparison

But what if $\frac{d|x_t|}{|x_t|}$ has nothing to do with the RC? Start with

$$\frac{d\Lambda_t}{\Lambda_t} = -\delta W \frac{dW_t}{W_t} - \delta \eta \frac{d\eta_t}{\eta_t} - \delta |x| \frac{d|x_t|}{|x_t|}$$

and add the assumption

$$\frac{d|x_t|}{|x_t|} = -\kappa^l \frac{dW^l_t}{W^l_t} - \kappa^H \frac{dW^H_t}{W^H_t} = -\left(\kappa^l - \kappa^H \frac{\eta_t}{1 - \eta_t}\right) \frac{d\eta_t}{\eta_t} - \left(\kappa^H + \kappa^l\right) \frac{dW_t}{W_t}$$

with $0 \leq \kappa^H < \kappa^l$.

The SDF becomes

$$\frac{d\Lambda_t}{\Lambda_t} = -\left(\delta W - \delta |x| \kappa W\right) \frac{dW_t}{W_t} - \left(\delta \eta - \delta |x| \kappa \eta\right) \frac{d\eta_t}{\eta_t}$$
## Pricing

### Forward arbitrage returns

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<th>3-factor specification</th>
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<tbody>
<tr>
<td>Market</td>
<td>2.210***</td>
<td>-4.227</td>
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<tr>
<td></td>
<td>(0.208)</td>
<td>(4.219)</td>
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<tr>
<td>HKM factor</td>
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<td>-2.575</td>
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<td></td>
<td>(0.110)</td>
<td>(2.728)</td>
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<tr>
<td>Basis shock</td>
<td>-0.084*</td>
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<td></td>
<td>(0.041)</td>
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<td>Market</td>
<td>0.061</td>
<td>-3.728</td>
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<tr>
<td></td>
<td>(0.367)</td>
<td>(3.256)</td>
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<tr>
<td>Int. equity</td>
<td>1.512***</td>
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<td></td>
<td>(0.251)</td>
<td>(2.680)</td>
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<td>Basis shock</td>
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<td>(0.027)</td>
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<th>2-factor specification</th>
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<td>Int. equity</td>
<td>1.998***</td>
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<td>(0.110)</td>
<td>(0.970)</td>
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<tr>
<td>Basis shock</td>
<td>-0.049**</td>
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<tr>
<td></td>
<td>(0.015)</td>
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Betting on widening arbitrage opportunities earns a negative risk premium because a dollar is more valuable in states with large arbitrage opportunities.

Why? Two alternative explanations:

- Investment opportunities are better in those states due to tighter regulatory constraints, and agents with $\gamma < 1$ need resources for investing.
- Because those are exactly the low-wealth states.

How to separate the two stories? Need a measure for $d\lambda^R_C$. Not easy...
Suggestion: use the model to identify the distortionary effects of a binding RC, i.e. how the $k^i$ set by the regulator affect equilibrium prices and allocations, and construct an empirical proxy for $\lambda_t^{RC}$ by measuring those effects in the data.

The authors already do that: one of the model predictions is that $|x_t| > 0$ only when $\lambda_t^{RC} > 0$; only $k^c > 0$ necessary.

However, taking a firmer stand on the $k^i$'s would generate much richer testable predictions.
Recall that the exp. excess return of intermediated asset $i$ is

$$E_t(dR_t^{e,i}) = -\text{cov}_t\left(dR_t^i, \frac{d\Lambda_t}{\Lambda_t}\right) + \text{sgn}(\alpha_t^i)k^i|x_t|dt$$

Implies that the intermediary SDF should price

- all assets for which $k^i = 0$
- all assets with $k^i > 0$ only when $\lambda_t^{RC} = 0$

However, when testing the intermediary SDF, the last term is ignored.
Testing the Model

HKM (2017) recognize that the price of risk for \( \frac{d\eta_t}{\eta_t} \) is time varying:

\[
\lambda_{\eta,t} = \gamma \text{var}_t \left( \frac{d\eta_t}{\eta_t} \right) = \gamma \sigma_{\eta,t}^2 \propto \left( \frac{1}{\eta_t} \right)^2
\]

and test by running predictability regressions

\[
r_{t+k} - r_f = a + b \left( \frac{1}{\eta_t} \right)^2 + u_{t+k}
\]

Here, the model price of risk for \( \frac{d|x_t|}{|x_t|} \) is

\[
\lambda_{|x|,t} \propto \sigma_{r|x|,t}^2
\]

which also yields testable return predictability implications. The predictability results in Table 2 also suggest \( \lambda_{|x|,t} \propto x_{t,h,\tau} - x_{t,0,\tau} \).
Testing the Model

Haddad and Muir (2018) test the cross-sectional implications of an IAP model by running predictability regressions

\[ \hat{r}_{i,t+k} = a_i + b_i \gamma_t + u_{i,t+k} \]

where \( \gamma_t \) is proxy for intermediary preferences.

Idea: more intermediated assets \( i \) should have higher \( b_i \), so check whether the cross-section of \( b_i \) lines up with the cross-section of asset specialization/complexity.

Here, you can run

\[ \hat{r}_{i,t+k} = a_i + b_i(x_{t,h,\tau} - x_{t,0,\tau}) + u_{i,t+k} \]
Summary

Very interesting paper that advances the IAP literature.

Would benefit from

- a firmer position on the type and effects of regulatory constraints,
- some additional empirical validation of the model implications.