Demand Propagation Through Traded Risk Factors

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This Discussion

The price impact of flows

- An example
- This paper
- An equivalence result

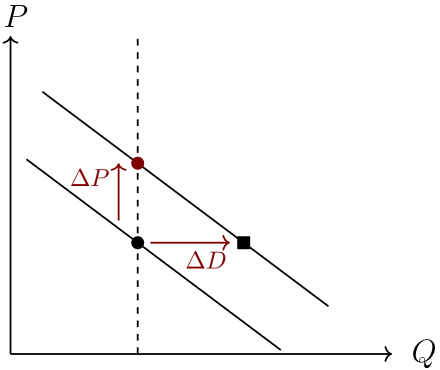
Why?

- Why do we care about flows for factors?
- Implementation and applications

Estimating price impact: an example

Toyota needs to buy FX swaps in Yen-USD

- Ask an intermediary — say Goldman Sachs (GS)
- Exchange rates adjust based on GS demand curve



Estimating price impact: an example

Toyota needs to buy FX swaps in Yen-USD

- GS needs to be willing to take in the flow
- Exchange rates adjust based on GS demand curve ... which is shaped by their **balance sheet**
- Effects on ... price of Yen but also on other currencies and all the other assets held by GS

$$\textbf{Supply (Toyota)}|_{\text{USD}} = \textbf{Demand (GS)}\left(S_{\$}, S_{¥}, S_{€}, S_{£}, \ldots, \text{other stuff}\right)|_{\text{USD}}$$

Estimating price impact: an example

Toyota needs to buy FX swaps in Yen-USD

- GS Demand Curve

$$\textbf{Supply (Toyota)}\big|_{\text{USD}} = \textbf{Demand (GS)}\left(S_{\$}, S_{¥}, S_{€}, S_{£}, \ldots, \text{other stuff}\right)\big|_{\text{USD}}$$

It's all connected

- When Toyota gets the Yen swap ...
- GS wants to change its Euro position
  - Yen takes balance sheet space
  - Yen comoves with the Euro
- To understand the effect we need to understand the whole demand curve of GS

$$\underbrace{\left(\frac{\partial \text{Demand}^{\text{GS}}}{\partial \mathbf{S}}\right)}_{\text{elasticity } \mathcal{E}} \begin{bmatrix} \Delta S_{¥} \\ \Delta S_{€} \\ \vdots \end{bmatrix} = \begin{bmatrix} f_{¥} \\ f_{€} \\ \vdots \end{bmatrix} \quad \Longleftrightarrow \quad \begin{bmatrix} \Delta S_{¥} \\ \Delta S_{€} \\ \vdots \end{bmatrix} = \underbrace{\mathcal{E}^{-1}}_{\text{multiplier } \mathcal{M}} \begin{bmatrix} f_{¥} \\ f_{€} \\ \vdots \end{bmatrix}$$

This paper

What this multiplier $\mathcal{M}$

- Inverse of aggregate demand curve … same information $\mathcal{M} = \mathcal{E}^{-1}$
- How do prices adjust for a given flow?

Standard asset pricing approach to the multiplier

- Demand for assets is mean-variance: $D = -\frac{1}{\gamma}\Sigma^{-1}P + \cdots$
- Multiplier comes from covariance matrix $\mathcal{M} = \gamma\Sigma$
- Factor decomposition of variance

$$\mathcal{M} = \gamma \underbrace{\sum_k b_k b_k^\top}_{\text{factor weights } b_k} + \gamma \operatorname{diag}\begin{pmatrix} \sigma_{\text{idio}1} \\ \sigma_{\text{idio}2} \\ \vdots \\ \sigma_{\text{idio}N} \end{pmatrix}$$

An equivalence result

General matrix multiplier

$$\begin{bmatrix} \Delta S_{¥} \\ \vdots \end{bmatrix} = \mathcal{M} \begin{bmatrix} f_{¥} \\ \vdots \end{bmatrix}$$

Multiplier decomposition

A decomposition result in HHHKL (Causal Inference for Asset Pricing, 2025)

- Define factor based quantities and prices
- *Exchange rates factors*: $S_k^{\text{factor}} = b_k^\top \mathbf{S}$
- *Flow factors*: $f_k^{\text{factor}} = b_k^\top \mathbf{f}$
- Idiosyncratic or "relative" prices S_{idio} and flows f_{idio}

An equivalence result

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Simple decomposition

- Set of K **meso multipliers** and 1 **relative multiplier** to evaluate price impact
  - Set of K univariate regressions

$$\begin{aligned}
\Delta S_{\text{idio}}^{\text{factor}} &= \widehat{\mathcal{M}} \cdot \Delta f_{\text{idio}} \\
\Delta S_1^{\text{factor}} &= \mathcal{M}_1 \cdot \Delta f_1^{\text{factor}} \\
&\vdots \\
\Delta S_K^{\text{factor}} &= \mathcal{M}_K \cdot \Delta f_K^{\text{factor}}
\end{aligned}$$

The important question

What are these factors?

- What are these factors? How do we find the b_k weights?
- This is what Goldman Sachs cares about!
- Factor risk, leverage, duration, regulatory constraints ...

The important question

How do we find these factors?

- **Lustig, Roussanov, Verdelhan:** Microfounded macro model to uncover the economically important risk in currencies
- **Chernov, Dahlquist, Lochstoer:** dimension of currencies is small enough that we can look at the whole matrix directly

- **This paper:** focus on component of risks that explain both the cross-section of returns and flows
- Objective is to maximize scaled covariance of dollar flow risk ($\mathbf{r}^\top \textbf{flow}$) with factor return ($\mathbf{r}^\top b_k$)

$$\max_b \frac{\text{cov}\left(\mathbf{r}^\top \textbf{flow}, \mathbf{r}^\top b\right)}{\text{var}(\mathbf{r}^\top b)}$$

- It is intuitive ... but does it make sense (and do we care that it does)?

Implementation

How do we identify the multipliers?

- Factors only tell us how to rotate the data
- How do we estimate factor k multiplier $\mathcal{M}_k$?
- Require time-series variation in supply along the dimensions of the factors
  - Exogenous Dollar flows, Carry flows, Euro-Yen flows
  - Treasury auctions across central banks

Applications

Why are these multipliers useful?

- Transmission of monetary policy (Loualiche, Pecora, Somogyi, Ward 2025) to exchange rates
- Role of intermediary balance sheets on volatility of exchange rates
- Backout intermediary frictions across currencies (this paper)
- ... across a variety of asset classes (e.g. Haddad Muir)

Final Thoughts

Great Paper! Go read it.

Take away

- New methods to find exchange rates risk factors
- Estimate price impact and substitution in currency markets