# Demand Propagation Through Traded Risk Factors

*Yu An and Amy W. Huber*

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Erik Loualiche[1] – University of Minnesota

[1]Prepared with the exceptional assistance of Valentin Haddad

# This Discussion

**The price impact of flows**

- Simple example
- What do you need to estimate a multiplier?

**This paper**

- How to find the factors? a flow-based approach
- How to estimate the factors?
- What do we learn?

# Estimating impact: an example

**What happens if I decide to purchase a trillion of dollars worth of Yen?**

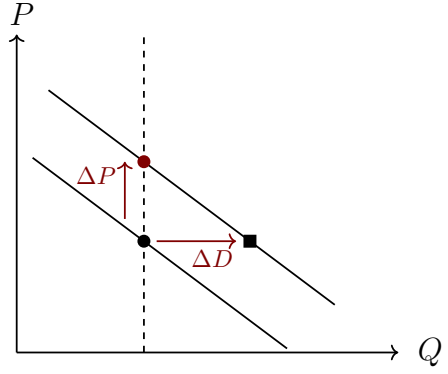
- Ask an intermediary — say Goldman Sachs (GS)
- Make sure their overall demand for assets and the price accomodate this trade
- Effects on ... price of Yen but also on other currencies and all the other assets held by GS

# Estimating impact: an example

**Toyota needs to buy FX swaps from GS Yen-USD**

- Exchange rates adjust based on GS balance sheet
  - They need to be willing to take in the flow

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



# Estimating impact: an example

**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

$$\mathcal{M} = \gamma \begin{pmatrix} \sigma_{\text{idio}_1} & & & \\ & \sigma_{\text{idio}_2} & & \\ & & \ddots & \\ & & & \sigma_{\text{idio}_N} \end{pmatrix} + \gamma \underbrace{\sum_k b_k b_k^\top}_{\text{factor weights } b_k}$$

- Answer simple questions about flows on prices

$$\Delta S_{¥}$$

# An equivalence result

**General matrix multiplier**

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

**Multiplier decomposition**

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

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

# An equivalence result

## Multiplier decomposition

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## Simple decomposition

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

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

# 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 ($\mathbf{r}^\top$**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

**Interesting Paper! Go read it.**

**Take away**

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