Trade Credit and International Stock Return Comovement

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Significant policy-relevance:

- Stock prices are important signals of value for resource allocation.
- Firms’ investments are potentially affected.
- Wealth shocks cause redistributions.
Much of the literature has emphasized the role of financial intermediaries.
Our Focus: Trade Credit and Cashflow Correlations

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Our Focus: Trade Credit and Cashflow Correlations

- Much of the literature has emphasized the role of financial intermediaries.

- Our focus is on the comovement of fundamentals.
- We study trade credit links between firms in different countries.
  - Introduces a link between the fundamentals of these firms.
  - Model of return correlations and empirical tests.
The Importance of Trade Credit

- Trade credit is an important source of financing for many firms.
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- Especially important in emerging markets; alternative source of growth financing when formal credit markets are thin.

- Neglected in the study of stock return comovement.
Accounts Receivable Turnover Time Series

- ALL - VW
- India - VW

Accounts Payable Turnover Time Series

- ALL-VW
- India-VW

Build a two-country, two-period model of representative firms connected by trade credit links.
**Approach**

1. Build a two-country, two-period model of representative firms connected by trade credit links.
   - Segmented stock markets, asymmetrically informed speculators, domestic investors.

2. Model implies cross-serial correlations of stock returns across countries.
   - Comparative statics: higher trade credit implies higher cross-serial correlation.

3. Employ firm-level data from 55 countries from 1993 to 2009, to provide empirical support for the model.
   - Producer-customer relationships, high and low trade credit firms.

4. Robustness checks.
   - Size and short-term debt double sorts.
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Basic Setup

- Two dates, \( t = 1, 2 \) and 2 countries, ‘consumer’ country \((C)\) and ‘producer’ country \((P)\).

- All investors have CARA utility with \( \gamma > 0 \) on date-2 wealth, \( W_2 \), and initial endowment \( W_1 > 0 \).

- Storage technology \( r = 0 \).

- Exogenous, random supply of shares \( z_i \), mean zero, variance \( \sigma^2 \).

- Rational expectations equilibrium, investors take prices as given and solve for asset demands. Equilibrium price is such that total stock demand equals total stock supply.
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- Two dates, $t = 1, 2$ and 2 countries, ‘consumer’ country (C) and ‘producer’ country (P).
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Market segmentation as in Merton (1987), Albuquerque et al., (2007). All investors have CARA utility with $\gamma > 0$ on date-2 wealth, $W_2$, and initial endowment $W_1 > 0$.

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Exogenous, random supply of shares $z_i$, mean zero, variance $\sigma^2 z_i$.

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Ramadorai (SBS, Oxford-Man, CEPR)
NIPFP-DEA Research Meeting 9/2010 8 / 27
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Dividends

Each country has a representative firm paying a liquidating dividend at date 2.

Consumer: \[ D_t^C = \varepsilon_t^C + u_t^C. \]

Producer: \[ D_t^P = \alpha D_t^C + \varepsilon_t^P + u_t^P, \alpha > 0 \]
Each country has a representative firm paying a liquidating dividend at date 2.

Consumer : \( D^C_t = \varepsilon^C_t + u^C_t \).

Producer : \( D^P_t = \alpha D^C_t + \varepsilon^P_t + u^P_t, \alpha > 0 \)

All shocks normal, \( \sigma^2_{\varepsilon^C}, \sigma^2_{u^C}, \sigma^2_{\varepsilon^P}, \sigma^2_{u^P} \).
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- Level of trade credit is \( \alpha. \) Note also: \( \text{E}[D_t^P D_t^C] = \alpha \sigma_{\varepsilon_C}^2 \)
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- We leave unmodeled the choice of trade credit. Reduced form, so we can focus on asset pricing effects.
Speculators hold assets from both two countries, have better information than domestics.
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Speculators learn both shocks, $\varepsilon^C$ and $\varepsilon^P$. 

$\bar{D}_C t = \varepsilon^C t$ and $\bar{D}_P t = \alpha \varepsilon^C t + \varepsilon^P t$,

$\bar{D}_i t$ is the speculators' expectation of the future dividend conditional on the signal, $u_i$ is the forecast error made by speculators.
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Write $D^C_t = \bar{D}^C_t = \varepsilon^C_t$ and $D^P_t = \alpha \varepsilon^C_t + \varepsilon^P_t$, then dividends can be represented as:

$$D^C_t = \bar{D}^C_t + u^C_t$$
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Domestic investors learn from prices, but only from local prices.
Asset Demands

- **Domestic demand:**

\[
\theta^i_t = \frac{E^d_t \left[ D^i_{t+1} - P^i_t \right]}{\gamma \text{Var}^d_i \left[ D^i_{t+1} - P^i_t \right]}. 
\]
Asset Demands

- **Domestic demand:**

\[
\theta_t^i = \frac{E_t^d [D_{t+1}^i - P_t^i]}{\gamma \text{Var}^d_t [D_{t+1}^i - P_t^i]}. 
\]

- **Speculator demand:**

\[
\begin{bmatrix}
\eta^C \\
\eta^P
\end{bmatrix} = \frac{1}{\gamma \sigma_{u_P}^2} \begin{bmatrix}
\frac{\sigma_{u_P}^2 + \alpha^2 \sigma_{u_C}^2}{\sigma_{u_C}^2} (\bar{D}_{t+1}^C - P_t^C) - \alpha (\bar{D}_{t+1}^P - P_t^P) \\
\bar{D}_{t+1}^P - P_t^P - \alpha (\bar{D}_{t+1}^C - P_t^C)
\end{bmatrix}. 
\]
Equilibrium

Equilibrium prices:

\[ P^C_t = \tilde{D}^C_{t+1} - b_{CC} \left( \tilde{D}^C_{t+1} - E^d_t \left( \tilde{D}^C_{t+1} \right) \right) - b_{CP} \left( \tilde{D}^P_{t+1} - E^d_t \left( \tilde{D}^P_{t+1} \right) \right) - h_{CC} z^C_t - h_{CP} z^P_t \]

We are interested in cross-country return correlation, and how it varies with level of trade credit (\( \alpha \)).
Equilibrium

- Equilibrium prices:

\[
P^C_t = \bar{D}^C_{t+1} - b_{CC} \left( \bar{D}^C_{t+1} - E_t \left( \bar{D}^C_{t+1} \right) \right) - b_{CP} \left( \bar{D}^P_{t+1} - E_t \left( \bar{D}^P_{t+1} \right) \right) - h_{CC} z_t^C - h_{CP} z_t^P
\]

- We are interested in cross-country return correlation, and how it varies with level of trade credit ($\alpha$):

\[
E \left[ D^P_{t+1} - p^P_t | p^C_t \right] = \frac{\text{Cov} \left( p^C_t, D^P_{t+1} - p^P_t \right)}{\text{Var} \left( p^C_t \right)} p^C_t
\]
Comparative Statics on Trade Credit
Covariance of Future Producer Return with Current Consumer Return
Baseline Empirical Methodology
Our Empirical Methodology

- Create three financial ratios for each firm-year:

  \[ ARTurnover_{i,t} = \frac{AR_{i,t}}{TotalSales_{i,t}'} \]

  \[ APTurnover_{i,t} = \frac{AP_{i,t}}{COGS_{i,t}'} \]

  \[ NetTradeCredit_{i,t} = \frac{AR_{i,t} - AP_{i,t}}{TotalSales_{i,t}'} \]

- Sort firms in each producer tercile by these (lagged) ratios and evaluate their stock returns.

- Comparative statics from the model predict that high trade credit firms will have larger stock return effects.
Data

- **Worldscope**: trade credit (annual), stock return (monthly), and balance-sheet (annual) information for firms.
  - Sample period 1993 to 2009.
  - 39 producer countries, 55 countries in total.
  - 32,598 unique firms.

- Only use industrial firms (exclude transportation, utility, banking, insurance and other financial firms).

- Annual bilateral trade (import and export) data from IMF Direction of Trade Statistics

- Annual GDP data from the IMF World Economic Outlook Database.
Correlations between MSCI and constructed indices

[Bar chart showing correlations between MSCI and constructed indices for various countries.]
Customers and Producers
Supplier-Importer strategies exist as well.

<table>
<thead>
<tr>
<th>Country</th>
<th>Export (Customer) Links</th>
<th>Import (Supplier) Links</th>
<th>Mean Stock Returns</th>
<th>Std Dev Stock Returns</th>
<th>Total Num Firms</th>
<th>Average Num Firms</th>
<th>Data Begin Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Producer</td>
<td>Trade Partner</td>
<td>Importer</td>
<td>Trade Partner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>0.596</td>
<td>4.858</td>
<td>10034</td>
</tr>
<tr>
<td>UK</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>0.637</td>
<td>4.405</td>
<td>2797</td>
</tr>
<tr>
<td>Emerging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>1.002</td>
<td>13.396</td>
<td>1360</td>
</tr>
<tr>
<td>Russia</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>2.262</td>
<td>14.453</td>
<td>103</td>
</tr>
<tr>
<td>Brazil</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>2.064</td>
<td>13.446</td>
<td>185</td>
</tr>
<tr>
<td>India</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>0.878</td>
<td>9.056</td>
<td>877</td>
</tr>
<tr>
<td>Country</td>
<td>Net Trade Credit</td>
<td></td>
<td>AR Turnover</td>
<td></td>
<td>AP Turnover</td>
<td></td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>Median</td>
<td>Mean</td>
<td>Std Dev</td>
<td>Median</td>
<td>Mean</td>
<td>Std Dev</td>
<td>Median</td>
</tr>
<tr>
<td>Developed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>0.065</td>
<td>0.064</td>
<td>0.008</td>
<td>0.153</td>
<td>0.155</td>
<td>0.011</td>
<td>0.217</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.075</td>
<td>0.076</td>
<td>0.011</td>
<td>0.181</td>
<td>0.178</td>
<td>0.016</td>
<td>0.205</td>
</tr>
<tr>
<td>Emerging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>0.139</td>
<td>0.165</td>
<td>0.154</td>
<td>0.359</td>
<td>0.362</td>
<td>0.156</td>
<td>0.255</td>
</tr>
<tr>
<td>Russia</td>
<td>0.159</td>
<td>0.192</td>
<td>0.136</td>
<td>0.230</td>
<td>0.312</td>
<td>0.190</td>
<td>0.252</td>
</tr>
<tr>
<td>India</td>
<td>0.096</td>
<td>0.106</td>
<td>0.034</td>
<td>0.254</td>
<td>0.257</td>
<td>0.030</td>
<td>0.196</td>
</tr>
</tbody>
</table>
Excess returns computed from factor models of the form:

\[ r_{p,t} - r_{f,t} = \alpha_p + \sum_{j=1}^{J} \beta_{p,j} F_{j,t} + \varepsilon_{p,t}. \]

- \( J = 1 \), with the excess return on the MSCI world index as the factor.
- \( J = 2 \), adds a momentum (MOM) factor to the MSCI world index, constructed from terciles of developed country returns, sorted by their past twelve month returns.
- \( J = 3 \), adds a value factor (HML), constructed by sorting countries into terciles based on their value-weighted firm-level book-to-market ratios.

Baseline Results

The baseline strategy doesn’t hold up over our sample period.

<table>
<thead>
<tr>
<th>Customer-Producer Sorts</th>
<th>Regression</th>
<th>Excess Return</th>
<th>One Factor (+MKT)</th>
<th>Two Factor (+MOM)</th>
<th>Three Factor (+HML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td></td>
<td>0.728 [0.501]</td>
<td>0.488 [0.283]</td>
<td>0.543 [0.282]</td>
<td>0.511 [0.275]</td>
</tr>
<tr>
<td>Bottom</td>
<td></td>
<td>0.281 [0.529]</td>
<td>0.037 [0.403]</td>
<td>0.167 [0.362]</td>
<td>0.110 [0.418]</td>
</tr>
<tr>
<td>Top - Bottom</td>
<td></td>
<td>0.447 [0.441]</td>
<td>0.451 [0.445]</td>
<td>0.376 [0.428]</td>
<td>0.401 [0.455]</td>
</tr>
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</table>
But there is a clear separation between high and low TC firms.

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<tr>
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<th>AR Turnover</th>
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<td>One Factor (+MKT)</td>
</tr>
<tr>
<td>Regression</td>
<td>Excess Return</td>
<td>One Factor (+MKT)</td>
</tr>
<tr>
<td>Bottom Trade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low TC</td>
<td>0.513 [0.525]</td>
<td>0.271 [0.417]</td>
</tr>
<tr>
<td>High TC</td>
<td>-0.127 [0.569]</td>
<td>-0.368 [0.438]</td>
</tr>
<tr>
<td>Difference</td>
<td>0.640 [0.304]</td>
<td>0.640 [0.303]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Excess Return</th>
<th>One Factor (+MKT)</th>
<th>Two Factor (+MOM)</th>
<th>Three Factor (+HML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom Trade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low TC</td>
<td>0.582 [0.506]</td>
<td>0.348 [0.399]</td>
<td>0.502 [0.368]</td>
<td>0.482 [0.401]</td>
</tr>
<tr>
<td>High TC</td>
<td>-0.281 [0.636]</td>
<td>-0.538 [0.496]</td>
<td>-0.427 [0.447]</td>
<td>-0.518 [0.553]</td>
</tr>
<tr>
<td>Difference</td>
<td>0.863 [0.354]</td>
<td>0.885 [0.347]</td>
<td>0.929 [0.363]</td>
<td>1.000 [0.439]</td>
</tr>
</tbody>
</table>
Trade Credit Sorts - Top Tercile
Non-monotonic, and seems to affect the bottom tercile the most.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Net Trade Credit</th>
<th>AR Turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excess Return</td>
<td>One Factor (+MKT)</td>
</tr>
<tr>
<td>Top Trade</td>
<td>0.910</td>
<td>0.688</td>
</tr>
<tr>
<td>Low TC</td>
<td>[0.503]</td>
<td>[0.329]</td>
</tr>
<tr>
<td>High TC</td>
<td>0.574</td>
<td>0.322</td>
</tr>
<tr>
<td></td>
<td>[0.537]</td>
<td>[0.309]</td>
</tr>
<tr>
<td>Difference</td>
<td>0.336</td>
<td>0.367</td>
</tr>
<tr>
<td></td>
<td>[0.296]</td>
<td>[0.299]</td>
</tr>
</tbody>
</table>
Long-Short Portfolios Across Terciles

High monthly returns for model-implied strategies.

<table>
<thead>
<tr>
<th>Measure</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excess Return</td>
<td>One Factor (+MKT)</td>
</tr>
<tr>
<td>Regression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Top – Short Bottom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low TC -High TC</td>
<td>0.974 [0.472]</td>
<td>0.969 [0.477]</td>
</tr>
<tr>
<td>High TC -High TC</td>
<td>0.983 [0.507]</td>
<td>0.947 [0.501]</td>
</tr>
<tr>
<td>Low TC -Low TC</td>
<td>0.629 [0.409]</td>
<td>0.622 [0.417]</td>
</tr>
<tr>
<td>High TC -Low TC</td>
<td>0.638 [0.440]</td>
<td>0.601 [0.436]</td>
</tr>
</tbody>
</table>
Robustness Checks

1. Trade credit may be correlated with other firm attributes that generate return spreads across firms.
   - Firm size.
   - Level of short-term debt.

2. We independently double-sort firms within the customer induced terciles by our trade credit measures and by these two firm attributes.
   - Return spreads across the trade credit dimension persist.
### Double Sorts

<table>
<thead>
<tr>
<th>Measure</th>
<th>AR Turnover</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Market Cap</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bottom Trade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>0.233</td>
<td>0.081</td>
<td>0.151</td>
<td>[0.578]</td>
</tr>
<tr>
<td>High</td>
<td>-0.203</td>
<td>-0.649</td>
<td>0.446</td>
<td>[0.722]</td>
</tr>
<tr>
<td>Low-High</td>
<td>0.436</td>
<td>0.730</td>
<td></td>
<td>[0.258]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measure</th>
<th>AR Turnover</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Short-term Debt</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bottom Trade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>0.629</td>
<td>0.220</td>
<td>0.409</td>
<td>[0.509]</td>
</tr>
<tr>
<td>High</td>
<td>0.055</td>
<td>-0.655</td>
<td>0.710</td>
<td>[0.685]</td>
</tr>
<tr>
<td>Low-High</td>
<td>0.574</td>
<td>0.874</td>
<td></td>
<td>[0.463]</td>
</tr>
</tbody>
</table>
Conclusions and Future Directions

1. Investigate the role of trade credit in international stock return comovement.

2. Build a simple model of trade credit as the correlation of dividends across consumer and producer firms.

Model predicts that increases in trade credit deliver higher cross-serial correlation of stock returns.

3. Test predictions of the model using customer-producer links.

Find that high levels of trade credit are associated with higher cross-serial correlation.

4. Future directions:
   1. Explore why results using APs are not as strong.
   2. Use our framework to distinguish models of contagion from fundamentals-based comovement.
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