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Are international fund flows pro- or counter-cyclical?

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We investigate whether international fund flows are pro-or counter-cyclical by employing a concordance index. International fund flows are investments in bond and equity markets by institutional investors, such as mutual funds, exchange traded funds, closed-end funds and hedge funds. We find that fund flows are pro-cyclical ahead of the business cycle and counter-cyclical contemporaneously after the business cycle.

Keywords: international fund flows; concordance index; equity flows; bond flows

JEL Classification: E32; F30; F32; G15; G23

1. Introduction

Most empirical studies find that capital flows are pro-cyclical, that is, during expansions foreign agents increase their purchases of domestic assets and domestic agents increase their purchases of foreign assets, while during contractions the opposite occurs (see, for instance, Broner *et al.*, 2013, and references cited therein). Whereas most previous research focuses on aggregate capital flows, we examine international fund flows, that is, investments in bond and equity markets by institutional investors, such as mutual funds, exchange traded funds (ETFs), closed-end funds and hedge funds. Since 2000, the assets under management by

international funds have increased dramatically, both in advanced and emerging markets. As noted by Gelos (2011), fund flows are more volatile than other types of capital flows. In addition, they play an increasingly important role in international financial markets and the transmission of shocks (Fratzscher, 2012; Raddatz and Schmukler, 2012; Puy, 2013). We investigate whether the (equity and bonds) funds flowing in and out of a country move in sync with the output of that country. For this purpose, we will use a concordance index that has been frequently used in business cycle research to measure the co-movement of two series (Harding and Pagan, 2006; Dungey and Jacobs, 2010). Usually, cyclicity is investigated using

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correlation analysis (Kaminsky *et al.*, 2005) or regression models (Broner *et al.*, 2013). However, as we focus on the cycle characteristics of fund flows and whether the phases of fund flow cycles and business cycles are synchronized, we employ the concordance index.

This article proceeds as follows. Section II focuses on the method to define fund flow cycles, the duration and amplitude of these cycles and the calculation of the concordance index. Section III presents the empirical results and Section IV concludes.

II. Methodology and Data

The business cycle can be regarded as the oscillating behaviour of economic activity, consisting of a peak, a recession period, a trough and an expansion period. We define fund flow cycles in the same way. Firstly, we date the turning points of fund flow cycles based on the algorithm of Bry and Boschan (1971). Let $CI_{i,t}$ denotes the Hodrick-Prescott-detrended series ($\lambda = 14\ 400$). There is a peak at time t if $CI_{i,t-k}, \dots, CI_{i,t-1} < CI_{i,t} > CI_{i,t+1}, \dots, CI_{i,t+k}$; and there is a trough at time t if $CI_{i,t-k}, \dots, CI_{i,t-1} > CI_{i,t} < CI_{i,t+1}, \dots, CI_{i,t+k}$. In line with Bry and Boschan (1971), we set $k = 5$ so that the interval between peaks and the next consecutive troughs lasts at least 6 months. We use censor rules to ensure that a phase lasts at least 6 months and a complete cycle lasts at least 15 months. Then, the period between peak and trough is defined as the downswing phase and that between trough and peak as the upswing. A dummy variable $S_{i,t}$ is used to identify the stage of flows, which takes value one in upswings and value zero in downswings. To match the frequencies, we use industrial production as our proxy for aggregate economic activity and follow the same procedure to define the phases of the business cycle.

Next, we calculate the duration and amplitude of cycles for each country and for the equity flows and bond flows separately. Upswings are labelled as TP (trough-to-peak) and downswings as PT (peak-to-trough). The average duration of upswings and downswings phases is calculated as:

$$DUR_{TP} = \frac{\sum_{t=1}^T S_t}{\sum_{t=1}^{T-1} (1 - S_{t+1})S_t}$$

and

$$DUR_{PT} = \frac{\sum_{t=1}^T (1 - S_t)}{\sum_{t=1}^{T-1} S_{t+1}(1 - S_t)}$$

The average amplitude is calculated as:

$$AMP_{TP} = \frac{\sum_{t=1}^T S_t \Delta CI_t}{\sum_{t=1}^{T-1} (1 - S_{t+1})S_t}$$

and

$$AMP_{PT} = \frac{\sum_{t=1}^T (1 - S_t) \Delta CI_t}{\sum_{t=1}^{T-1} S_{t+1}(1 - S_t)}$$

Harding and Pagan (2002) propose a concordance index to measure the co-movement of two cycles. The concordance index of two binary series S_{1t} and S_{2t} is the fraction of the period that they are synchronized. The number $\#(1,1)$ denotes that the business cycle and fund flow cycle are both in the upswing; $\#(1) = \#(1,0) + \#(0,1)$ denotes that one of them is in upswing and the other is in downswing; $\#(0,0)$ denotes that both the cycles are in downswing. Following Dungey and Jacobs (2010), the concordance index (I) is calculated as,

$$I_t = \frac{\#(1,1) + \#(0,0)}{T} = 1 - \frac{\#(1)}{T}$$

where total observations (T) is given by,

$$T = \#(1,1) + \#(1) + \#(0,0)$$

The concordance index takes value one if two cycles are fully synchronized and it is zero if they are not synchronized at all. Hence, if the concordance index is larger than 0.5, fund flows are procyclical. If it is smaller than 0.5, they are countercyclical. To investigate the time-varying nature of the relationship, we calculate the concordance index for $(t-6,t)$, $(t-3,t)$, (t,t) , $(t+3,t)$, $(t+6,t)$, where $(t-6,t)$ indicates the concordance index between the fund flow cycle at time $t-6$ and the business cycle at time t .

Table 1. Duration and amplitude of equity flow, bond flow and industrial production index

	Number of months	Number of turning points				Duration		Amplitude		
		Downswings		Peaks	Troughs	DUR(TP)	DUR(PT)	AMP(TP)	AMP(PT)	
		Upswings								
Equity flow: January 1996 to June 2013										
All countries	84.50		90.44	5.54	5.57	16.16	16.51	2.75	-2.59	
Developed countries	78.20		85.88	5.18	5.33	16.38	16.61	2.58	-2.21	
Developing countries	93.50		96.96	6.07	5.93	15.85	16.37	2.99	-3.12	
Bond flow: January 2004 to June 2013										
All countries	47.20		52.31	3.25	2.55	14.85	21.33	3.42	-4.62	
Developed countries	42.51		51.19	3.08	2.46	14.16	21.46	3.12	-4.19	
Developing countries	53.39		53.79	3.46	2.68	15.77	21.15	3.81	-5.17	
Industrial production: January 1996 to June 2013										
All countries	96.56		95.14	5.37	5.34	18.74	19.05	8.15	-8.50	
Developed countries	97.54		101.85	5.63	5.61	17.96	18.99	7.25	-7.71	
Developing countries	95.23		85.97	5.00	4.97	19.81	19.12	9.37	-9.58	

Notes: According to the Word Bank, economies are divided according to 2012 Gross National Income (GNI) per capita, calculated using the World Bank Atlas method. The groups are: low income, \$1035 or less; lower middle income, \$1036–\$4085; upper middle income, \$4086–\$12 615; and high income, \$12 616 or more. Low-income and middle-income economies are referred to as developing economies.

Our data are derived from EPFR Global (Cambridge, MA, USA) and relate to monthly country-level fund flows, which is the net fund flows flowing into a specific country. The sample includes 68 countries for equity flows (January 1996–June 2013) and 65 countries for bond flows (January 2004–June 2013).

III. Results

The cyclical characteristics are presented in Table 1. Equity flows experienced 5.5 cycles on average, with about the same duration of upswings and downswings. For bonds, we find that the duration of downswings is much longer than that of upswings. Besides, bond flows tend to have longer duration in downswings and higher amplitude, which indicates that they are more volatile than equity flows. Regarding the difference between developed and developing countries, fund flows going to developing countries are more volatile than those going to developed countries, both in an upswing and downswing period. The duration and amplitude of developing countries' business cycle are significantly larger than those of developed countries.

The concordance index for each country is provided in the Appendix. Figure 1 shows the results for the concordance index for equity and bond flows. Equity and bond flows tend to be pro-cyclical, ahead of the business cycle, and behave counter-cyclically contemporaneously after the business cycle. Bond flows are even more counter-cyclical, which indicates that more money flows out of the country through bond

Fig. 1. Concordance index for equity flows and bond flows

investments when it is in an upswing. As to the difference between developed and developing countries (see Fig. 2), there are no significant differences for equity flows. For bond flows, developed countries present more significant counter-cyclical behaviour contemporaneously after the business cycle.

IV. Conclusion

We study whether international bond and equity fund flows are pro- or counter-cyclical. We find that bond flows are more volatile than equity flows with longer duration for downswings and larger amplitude. Fund flows into developing countries are more volatile than those into developed countries. Fund flows tend to be pro-cyclical ahead of the business cycle and counter-cyclical contemporaneously after the business cycle. Our research provides new evidence

Fig. 2. Concordance index: developed and developing countries

about the cyclicalities of fund flows, and we conclude that fund flows tend to stabilize the business cycle.

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Appendix: Concordance index for equity flows and bond flows

Equity flows						Bond flows					
Country	(<i>t</i> −6, <i>t</i>)	(<i>t</i> −3, <i>t</i>)	(<i>t</i> , <i>t</i>)	(<i>t</i> +3, <i>t</i>)	(<i>t</i> +6, <i>t</i>)	Country	(<i>t</i> −6, <i>t</i>)	(<i>t</i> −3, <i>t</i>)	(<i>t</i> , <i>t</i>)	(<i>t</i> +3, <i>t</i>)	(<i>t</i> +6, <i>t</i>)
<i>Panel A: developed countries</i>											
Australia	0.583	0.521	0.476	0.448	0.434	Australia	0.607	0.641	0.611	0.537	0.400
Austria	0.442	0.411	0.382	0.386	0.393	Austria	0.368	0.296	0.257	0.206	0.167
Belgium	0.638	0.603	0.556	0.462	0.400	Belgium	0.580	0.495	0.415	0.305	0.221
Canada	0.601	0.539	0.486	0.428	0.448	Canada	0.432	0.385	0.351	0.284	0.305
Chile	0.645	0.584	0.538	0.528	0.521	Chile	0.692	0.673	0.564	0.450	0.324
Croatia	0.602	0.510	0.382	0.329	0.368	Croatia	0.673	0.533	0.382	0.243	0.241
Czech Republic	0.589	0.498	0.418	0.357	0.353	Czech Republic	0.421	0.455	0.478	0.459	0.472
Denmark	0.478	0.489	0.451	0.434	0.448	Denmark	0.591	0.484	0.362	0.316	0.305
Finland	0.609	0.582	0.535	0.469	0.386	Finland	0.670	0.582	0.500	0.389	0.284
France	0.696	0.610	0.514	0.393	0.331	France	0.500	0.385	0.277	0.179	0.158
Germany	0.587	0.475	0.389	0.352	0.441	Germany	0.670	0.549	0.436	0.316	0.211
Greece	0.673	0.556	0.404	0.319	0.363	Greece	0.602	0.505	0.351	0.232	0.200
Hong Kong	0.608	0.569	0.520	0.475	0.365	Hong Kong	0.598	0.520	0.431	0.394	0.313
Ireland	0.362	0.440	0.556	0.552	0.497	Ireland	0.580	0.560	0.543	0.558	0.568
Israel	0.518	0.426	0.416	0.431	0.495	Israel	0.568	0.592	0.604	0.569	0.461
Italy	0.500	0.454	0.424	0.414	0.441	Italy	0.557	0.473	0.394	0.305	0.263
Japan	0.507	0.525	0.472	0.414	0.393	Japan	0.580	0.473	0.404	0.368	0.379
Korea (South)	0.649	0.580	0.462	0.343	0.294	Korea (South)	0.654	0.545	0.442	0.396	0.417
Kuwait	0.293	0.230	0.172	0.215	0.292	Kuwait	0.237	0.268	0.455	0.600	0.644
Lithuania	0.579	0.556	0.461	0.392	0.392	Lithuania	0.716	0.629	0.521	0.351	0.203
Netherlands	0.674	0.511	0.396	0.331	0.297	Netherlands	0.602	0.418	0.287	0.211	0.179
New Zealand	0.676	0.705	0.577	0.434	0.400	New Zealand	0.837	0.876	0.707	0.505	0.316
Norway	0.449	0.404	0.347	0.290	0.303	Norway	0.489	0.505	0.489	0.505	0.537
Oman	0.559	0.502	0.447	0.420	0.436	Poland	0.423	0.383	0.382	0.414	0.426
Poland	0.658	0.624	0.543	0.444	0.368	Portugal	0.745	0.552	0.377	0.226	0.113
Portugal	0.589	0.620	0.620	0.556	0.505	Qatar	0.644	0.458	0.309	0.225	0.296
Qatar	0.548	0.684	0.759	0.675	0.513	Russia	0.458	0.455	0.434	0.396	0.333
Russia	0.495	0.444	0.423	0.401	0.373	Saudi Arabia	0.226	0.235	0.297	0.421	0.579
Saudi Arabia	0.401	0.300	0.252	0.299	0.348	Singapore	0.523	0.464	0.416	0.405	0.426
Singapore	0.553	0.553	0.482	0.385	0.359	Slovakia	0.387	0.412	0.541	0.632	0.553
Slovakia	0.562	0.500	0.463	0.497	0.481	Spain	0.750	0.626	0.511	0.389	0.242
Slovenia	0.604	0.551	0.494	0.428	0.415	Sweden	0.557	0.484	0.436	0.337	0.232
Spain	0.594	0.546	0.458	0.393	0.414	Switzerland	0.483	0.500	0.453	0.442	0.463
Sweden	0.710	0.667	0.604	0.483	0.359	Taiwan	0.439	0.432	0.404	0.426	0.468
Switzerland	0.579	0.553	0.500	0.432	0.389	United Kingdom	0.633	0.564	0.519	0.486	0.486
Taiwan	0.616	0.583	0.541	0.449	0.392	USA	0.477	0.491	0.504	0.495	0.500
United Kingdom	0.609	0.582	0.486	0.400	0.359	Uruguay	0.448	0.426	0.369	0.306	0.204
USA	0.408	0.360	0.314	0.390	0.487						
Cyprus	0.629	0.543	0.495	0.438	0.417						
Estonia	0.560	0.475	0.394	0.319	0.307						
<i>Average</i>	<i>0.566</i>	<i>0.522</i>	<i>0.465</i>	<i>0.415</i>	<i>0.399</i>	<i>Average</i>	<i>0.552</i>	<i>0.495</i>	<i>0.438</i>	<i>0.386</i>	<i>0.348</i>
<i>Median</i>	<i>0.588</i>	<i>0.541</i>	<i>0.468</i>	<i>0.417</i>	<i>0.393</i>	<i>Median</i>	<i>0.580</i>	<i>0.491</i>	<i>0.434</i>	<i>0.394</i>	<i>0.316</i>
<i>Panel B: developing countries</i>											
Argentina	0.685	0.602	0.474	0.357	0.304	Argentina	0.533	0.398	0.252	0.126	0.065
Brazil	0.640	0.544	0.469	0.406	0.407	Brazil	0.731	0.694	0.570	0.450	0.343
Bulgaria	0.548	0.459	0.395	0.331	0.301	Bulgaria	0.570	0.495	0.453	0.440	0.346
China	0.512	0.466	0.431	0.406	0.426	China	0.546	0.676	0.614	0.523	0.463
Colombia	0.631	0.519	0.411	0.357	0.353	Colombia	0.543	0.500	0.432	0.405	0.361
Egypt	0.578	0.698	0.733	0.717	0.591	Egypt	0.686	0.676	0.613	0.477	0.352
Hungary	0.564	0.424	0.356	0.304	0.284	Hungary	0.510	0.374	0.300	0.315	0.352
India	0.693	0.590	0.471	0.391	0.368	India	0.762	0.769	0.694	0.577	0.435

(Continued)

Continued

Equity flows						Bond flows					
Country	(<i>t</i> −6, <i>t</i>)	(<i>t</i> −3, <i>t</i>)	(<i>t</i> , <i>t</i>)	(<i>t</i> +3, <i>t</i>)	(<i>t</i> +6, <i>t</i>)	Country	(<i>t</i> −6, <i>t</i>)	(<i>t</i> −3, <i>t</i>)	(<i>t</i> , <i>t</i>)	(<i>t</i> +3, <i>t</i>)	(<i>t</i> +6, <i>t</i>)
Indonesia	0.481	0.451	0.426	0.440	0.474	Indonesia	0.519	0.577	0.596	0.495	0.380
Jordan	0.510	0.546	0.534	0.483	0.441	Kazakhstan	0.629	0.528	0.432	0.369	0.333
Kazakhstan	0.652	0.449	0.261	0.237	0.318	Malaysia	0.579	0.636	0.637	0.595	0.472
Malaysia	0.550	0.537	0.490	0.425	0.358	Mexico	0.362	0.380	0.405	0.432	0.426
Mexico	0.728	0.634	0.534	0.444	0.431	Morocco	0.182	0.106	0.200	0.320	0.440
Morocco	0.598	0.575	0.494	0.398	0.304	Nigeria	0.486	0.457	0.467	0.480	0.495
Nigeria	0.418	0.340	0.330	0.361	0.392	Pakistan	0.683	0.617	0.555	0.523	0.472
Pakistan	0.634	0.605	0.481	0.386	0.373	Panama	0.467	0.389	0.351	0.324	0.398
Panama	0.467	0.439	0.460	0.463	0.483	Peru	0.545	0.481	0.458	0.445	0.407
Peru	0.573	0.530	0.468	0.466	0.500	Philippines	0.579	0.609	0.593	0.532	0.463
Philippines	0.421	0.351	0.332	0.377	0.485	Romania	0.558	0.495	0.445	0.423	0.407
Romania	0.548	0.492	0.417	0.378	0.363	South Africa	0.398	0.405	0.395	0.405	0.398
South Africa	0.498	0.374	0.311	0.300	0.358	Sri Lanka	0.429	0.214	0.071	0.128	0.306
Sri Lanka	0.381	0.405	0.262	0.128	0.083	Thailand	0.565	0.712	0.781	0.685	0.528
Thailand	0.615	0.580	0.529	0.444	0.381	Tunisia	0.635	0.654	0.609	0.559	0.407
Tunisia	0.510	0.494	0.429	0.396	0.433	Turkey	0.577	0.523	0.445	0.369	0.269
Turkey	0.475	0.449	0.428	0.425	0.446	Ukraine	0.577	0.505	0.436	0.414	0.370
Ukraine	0.423	0.431	0.453	0.481	0.477	Venezuela	0.505	0.407	0.333	0.324	0.361
Venezuela	0.556	0.475	0.359	0.277	0.281	Ecuador	0.573	0.453	0.367	0.297	0.269
Malawi	0.372	0.413	0.571	0.596	0.618	Serbia	0.716	0.582	0.436	0.305	0.168
Average	0.545	0.495	0.440	0.399	0.394	Average	0.551	0.511	0.462	0.419	0.375
Median	0.549	0.483	0.442	0.397	0.386	Median	0.561	0.502	0.445	0.428	0.389

Notes: Countries are divided along 2012 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income $\leq$ \$1035; lower middle income \$1036–\$4085; upper middle income \$4086–\$12 615; and high income $\geq$ \$12 616 or more. The first two are referred to as developing economies.