Deviations from fundamental value and future closed-end country fund returns

Luis Berggrun
CESA Business School, Bogota, Colombia
Emilio Cardona
Universidad de Los Andes, Bogota, Colombia, and
Edmundo Lizarzaburu
ESAN, Lima, Peru

Abstract

Purpose – This article examines whether deviations from fundamental value or closed-end country fund's discounts or premiums forecast future share price returns or net asset returns.

Design/methodology/approach – The main empirical (econometric) tool is a vector autoregressive (VAR) model. The authors model share price returns and net asset returns as a function of their lagged values, the discounts or premiums, and a control variable for local market returns. The authors also conduct Dickey Fuller and Granger causality tests as well as impulse response functions.

Findings – It was found that deviations from fundamental value do predict share price returns. This predictability is contrary to weak-form market efficiency. Premiums or discounts predict net asset returns but weakly.

Originality/value – The findings point to the idea that the closed-end fund market is somewhat predictable and inefficient (in its weak form) since the market appears to be able to anticipate a fund's future returns using information contained in the premiums (or discounts). In particular, the market has the ability to anticipate future behaviour because growing premiums forecast declining share price returns for one or two periods ahead.

Keywords Closed-end fund, Discount, Premium, Puzzle, Vector autoregressive models

Paper type Research paper

1. Introduction

Closed-end funds (CEFs) are investment companies that issue a fixed number of shares and invest the resources pursuing the objective of the fund. Unlike more popular open-end funds, CEF shares (traded on a stock exchange) cannot be redeemed by investors at their net asset value (NAV). It is now widely acknowledged that CEF share prices trade at levels that are significantly different from the market value of the assets that the CEF invests in. This phenomenon is known as the closed-end fund puzzle. According to Roenfeldt and Tuttle (1973), even though some funds trade at a premium (i.e. share prices are higher than NAV per share), discounts of 10 and 20% are the norm for CEFs. In addition, premiums and discounts appear to have a life cycle. Based on Lee *et al.* (1991) this cycle has four parts: (1) CEFs start trading at a premium of almost 10%. By and large, the premium is related to setup costs that reduce NAV (but not share prices) (2) 120 days after the inception of the fund, discounts are

JEL Classification — G12, G15, G23, G40

close to 10%. From this moment on, discounts are more likely to occur than premiums (3) discounts are subject to great variability in time and (4) in a merger, liquidation or conversion of the CEF to an open-end fund, discounts narrow and converge to zero.

Market inefficiency implies that market participants can obtain abnormal returns by exploiting return predictability based on past returns or other variables. The extant literature has shown the inefficiency of the CEF market because of the assets that the CEF invests in, and the CEF itself should trade at equivalent prices (following the law of one price). Furthermore, given that the CEF is nothing more than a portfolio of assets, discounts are a clear violation of the additivity concept that implies that in a perfect market, the value of a group of assets must equal the sum of the individual assets that belong to the group. In this document, we explore another type of market inefficiency, whether deviations from fundamental value (i.e. whether funds trade at a discount or premium) can forecast future CEF returns. This would be a clear violation of market efficiency in its weak form (Fama, 1970).

This study focuses on a specific type of closed-end fund. We concentrate on closed-end country funds that invest in a single country. Among the different types of CEFs in the USA (municipal bond, taxable US bond, diversified US equity, sector and speciality, global and international, and single-country funds), single country funds are possibly more subject to systematic or non-systematic risk, noise trading and considerable information asymmetries. These three features make our study more interesting and justify our sample choice.

2. Literature review
Several papers have analysed the *closed-end fund puzzle* and put forward alternative explanations for the presence of discounts or premiums. The most common explanations are related to rational and behavioural factors.

Some studies support the rational explanation of market segmentation as a determinant of CEF premiums or discounts. Kim and Song (2010) find that the higher the investment barriers [both direct and indirect (e.g. political risk)] that foreign investors face, the higher the premium of closed-end country funds that trade in the USA. This positive relationship supports the idea that investors derive diversification gains when trading in CEFs (and thus are willing to pay share prices that exceed NAVs), and that CEFs are a way to bypass investment restrictions in the funds' local or target markets [1]. Davies *et al.* (2017) find a different effect of market segmentation on CEF prices and NAVs. They use a time-varying measure of market segmentation for the UK-traded closed-end country funds (that invest in emerging markets) and report that direct barriers to foreign investors are *negatively* related to both closed-end fund price and NAV returns. Overall, both NAV and prices tend to decline after the enforcement of barriers possibly due to the expectation of lower capital flows directed towards the segmented (country) market.

Davies *et al.* (2013) examine another rational explanation related to illiquidity. They study the impact of both fund and country illiquidity on the premium of UK closed-end country funds. Using a sample of funds that invest in either developed or developing markets, they find that fund illiquidity is not significant in explaining the premium (after considering several control variables). Interestingly, they also document that the premium and country illiquidity are positively related indicating that increasing (country) illiquidity augments the premium. This positive relationship implies that investors are willing to pay more for foreign markets that are deemed more illiquid but offer more upside potential.

An additional rational explanation to CEF discounts or premiums is related to the extent of arbitrage activity. Lee *et al.* (1990) analyse the two strategies an arbitrageur can implement when the CEF trades at a premium or discount. If the CEF trades at a premium, the arbitrageur can sell the fund short and go long on the underlying portfolio. In countries with

restricted or segmented markets, this strategy is difficult and costly, and thus deviations from intrinsic value may be justifiable from a rational point of view. If the CEF trades at a discount, the strategy is straightforward: liquidate the fund or open-end it (so the discount vanishes). Nevertheless, taking over a fund is difficult given (among other reasons) the fierce resistance of fund managers. Yet, discounts may be justifiable from a rational perspective.

In more recent literature examining arbitrage and deviations from fundamental value, Alexander and Peterson (2017) find evidence that is consistent with an efficient market in which short-selling activity occurs often in the CEF market. Interestingly, short-selling occurs for funds that trade at a premium and even at a discount. Furthermore, premia and discounts tend to revert to fundamental values consistent with the idea that investors push prices towards equilibrium levels (e.g. premiums decline over the next five days after short-selling activities increase).

On the other hand, a behavioural explanation for the premiums or discounts in the CEF market is related to the presence of non-informed (or "noise") investors that create an additional risk for rational (or fundamental) investors. The idea is that this risk (or noise trader risk) commands a price and could be a plausible explanation for the difference between NAV and share prices.

Lee *et al.* (1991) argue that irrational investors are more prevalent in the ownership of CEFs than in the ownership of the underlying assets of the funds. When irrational investors become pessimistic about the future, the market value of the CEF dwindles (below NAV), and prevents rational investors from buying the fund (at discount prices) due to noise trader risk. Thaler (2016) explains a case of noise trading in which irrational behaviour ends up affecting prices in the CEF market and creates a wedge between prices and intrinsic value. The Cuba CEF (the fund did not own Cuban stocks but US and Mexican equities) used to trade at a 10–15% discount to NAV. On December 18, 2014, share prices rose (so the fund started trading at a 70% premium, while NAV remained the same) after US President Obama lifted commercial restrictions on Cuba. Even though NAV remained constant, the (irrelevant) news of a change in US policy affected CEF prices. Even more puzzling was the fact that the premium lasted for several months.

3. Method

3.1 Data

We use monthly data in US dollars of 29 CEFs that invest in developed and emerging markets. These 29 funds trade in the USA and UK. We chose these two countries since funds trading in the US and UK had the most complete information. To be able to control by region we decided to include closed-end *country* funds given the fact that these funds invest either in one country or region. Historically, closed-end country funds have served as an instrument for investors to access foreign markets. Table 1 reveals that our CEFs invest in 12 countries. The country with the highest number of funds is Japan.

Our sample period spans from 1988 to 2010. We gathered information from the Closed-End Fund Association (CEFA) and Investec Bank and Asset Manager websites. We also collected information from Bloomberg. The two main variables of our study are RPX or the fund's share price return and RNAV is equal to returns based on NAV changes. Both share prices and NAVs are adjusted for dividends and splits. Moreover, returns are continuously compounded. RPX and RNAV are calculated as follows:

$$\text{RPX}_t = ln\left(\frac{\text{PX}_t}{\text{PX}_{t-1}}\right)$$

$$\text{RNAV}_t = ln\left(\frac{\text{NAV}_t}{\text{NAV}_{t-1}}\right)$$

Ticker	Name	Country	Index
AJG	Atlantis Japan Growth Fund	Japan	Nikkei 225
AJIT	Aberdeen Japan Investment Trust Plc	Japan	Nikkei 225
BGFD	Baillie Gifford Japan Trust PLC	Japan	Nikkei 225
BGS	Baillie Gifford Shin Nippon	Japan	Nikkei 225
CAF	Morg Stan China A	China	Shanghai
EEA	European Equity Fund	Germany	DAX
FJV	Fidelity Japanese Values PLC	Japan	Nikkei 225
GCH	Aberdeen Greater China	China	Shanghai
GF	New Germany Fund	Germany	DAX
IFF	Morg Stan India Inv	India	Sensex
IFN	India Fund	India	Sensex
ISL	Aberdeen Israel Fund	Israel	TASE
JEQ	Aberdeen Japan Equity	Japan	Nikkei 225
JFJ	JPMorgan Japanese Investment Trust	Japan	Nikkei 225
JII	JPMorgan Indian Investment Trust	India	Sensex
JMC	JPMorgan Chinese Investment Trust	China	Shanghai
JOF	Japan Small Cap	Japan	Nikkei 225
JPB	JPMorgan Brazil Investment Trust	Brazil	Bovespa
JPS	JPMorgan Japan Smaller Companies Investment Trust	Japan	Nikkei 225
JRS	JPMorgan Russian Securities Plc	Russia	MOEX
MXF	Mexico Fund	Mexico	IPC
NAIT	The North American Income Trust plc	USA	S&P 500
NII	New India Investment Trust Plc	India	Sensex
SGF	Aberdeen Singapore Fund	Singapore	STI
SJG	Schroder Japan Growth Fund	Japan	Nikkei 225
TDF	Templeton Dragon Fund	China	Shanghai
TRF	Templeton Russia & E Eur	Russia	MOEX
TWN	Taiwan Fund	Taiwan	TAIEX
VNH	Vietnam Holding Limited	Vietnam	HNX

Note(s): This table reports the ticker and fund name of the 29 closed-end country funds in our sample. The second to last column shows the country of origin of the fund's assets (or its local or target market). The last column reports the stock index used to proxy for local or target market returns
Source(s): Own elaboration

Table 1.
List of funds

where, PX is the share market price of the fund, NAV is the net asset value of the fund, t stands for time, and ln for natural logarithm. We also estimate the fund's premium (PR) or discount (when the variable is negative) as follows:

$$PR_t = \frac{PX_t - NAV_t}{NAV_t}$$

Table 2 reports mean values per fund for RPX, RNAV and PR. For most of the funds (20), the mean share price return is positive and fluctuates from -1.30% to 0.88% per month. In terms of asset returns, RNAV is also positive for most (23) of the CEFs and ranges from -1.09% to 0.82%. Most funds trade at a discount to NAV that averages 8.65%.

3.2 Model and procedure

Our main empirical (econometric) tool is a vector autoregressive (VAR) model. In a VAR model, all variables are deemed endogenous since each variable is expressed as a linear function of its lagged values and lags of the remaining variables. This approach makes it possible to capture the co-movement and short-term dynamics of the variables included in the model. A VAR model is quite flexible, and for this type of model, it is not common to analyse

Ticker	RPX	RNAV	PR
AJG	0.53%	0.48%	−9.12%
AJIT	0.88%	0.73%	−12.10%
BGFD	0.50%	0.45%	−8.12%
BGS	0.36%	0.33%	−10.23%
CAF	0.35%	0.69%	−5.62%
EEA	0.06%	0.09%	−8.00%
FJV	0.30%	0.30%	−13.61%
GCH	−0.08%	−0.04%	−10.57%
GF	−0.03%	0.08%	−14.88%
IFF	0.31%	0.33%	−8.57%
IFN	0.27%	0.33%	−8.65%
ISL	0.15%	0.18%	−11.41%
JEQ	−0.05%	−0.02%	−1.82%
JFJ	0.28%	0.41%	−8.94%
JII	0.69%	0.72%	−10.02%
JMC	0.22%	0.28%	−8.15%
JOF	−0.12%	0.03%	−0.27%
JPB	−1.30%	−1.09%	−3.46%
JPS	−0.32%	−0.41%	−13.13%
JRS	0.81%	0.82%	−9.00%
MXF	0.34%	0.38%	−11.62%
NAIT	0.32%	0.33%	−4.23%
NII	0.76%	0.71%	−10.91%
SGF	0.07%	0.05%	−9.02%
SJG	0.34%	0.35%	−9.72%
TDF	0.16%	0.26%	−13.02%
TRF	−0.17%	−0.07%	4.01%
TWN	−0.15%	−0.02%	−3.63%
VNH	−0.05%	0.17%	−17.00%
Grand mean	0.19%	0.24%	−8.65%

Note(s): This table includes mean values of our main variables. RPX stands for share price return, RNAV for returns estimated from NAV (net asset value) changes, and PR for the premium (if positive) or discount (if negative). The last row reports the sample mean across all funds of our three main variables
Source(s): Own elaboration

Table 2.
Mean values per fund –
RPX, RNAV and PR

the results per equation or individually (Arias and Torres, 2004). In short, we estimated two VAR models:

Model 1:

$$\text{RPX}_t = \alpha_{10} + \alpha_{12}\text{RPX}_{t-1} + \alpha_{13}\text{PR}_{t-1} + \alpha_{14}\text{RPX}_{t-2} + \alpha_{15}\text{PR}_{t-2} + \gamma_1\text{LMR}_t + e_{1t}$$

$$\text{PR}_t = \alpha_{20} + \alpha_{22}\text{RPX}_{t-1} + \alpha_{23}\text{PR}_{t-1} + \alpha_{24}\text{RPX}_{t-2} + \alpha_{25}\text{PR}_{t-2} + \gamma_2\text{LMR}_t + e_{2t}$$

Model 2:

$$\text{RNAV}_t = \alpha_{10} + \alpha_{12}\text{RNAV}_{t-1} + \alpha_{13}\text{PR}_{t-1} + \alpha_{14}\text{RNAV}_{t-2} + \alpha_{15}\text{PR}_{t-2} + \gamma_1\text{LMR}_t + e_{1t}$$

$$\text{PR}_t = \alpha_{20} + \alpha_{22}\text{RNAV}_{t-1} + \alpha_{23}\text{PR}_{t-1} + \alpha_{24}\text{RNAV}_{t-2} + \alpha_{25}\text{PR}_{t-2} + \gamma_2\text{LMR}_t + e_{2t}$$

In Model 1, the return variable is related to share price, while in Model 2, returns are related to NAV. PR is the premium (or discount) and LMR (local-market return) is an exogenous control variable that stands for the market return of the country of origin of the CEF assets. Our models thus include both local variables and variables related to the CEF's country of trading. These two models are estimated separately for each of the 29 CEF country funds in the sample.

We used the Akaike (1974) information criterion (AIC) to choose the optimal number of lags of the VAR models. For most of the funds (89.65% and 79.31% for models 1 and 2, respectively), the optimal number of lags was equal to two (purposely coinciding with our equations for the two VAR models) (see Table 3).

Once the optimal number of lags has been chosen and the problem of serial autocorrelation discarded [Lagrange-multiplier (LM) test results are available upon request], it is necessary to determine whether RPX, RNAV and PR are stationary. One of the usual requisites for a proper estimation of a VAR model is that the variables that enter the model should be stationary (Arias and Torres, 2004) [2]. In this regard, when one establishes that the mean and variance is constant (i.e. the variable is stationary), it is possible to conclude that the relationship among variables is a short-term relationship, and if there is the predictive power of the premiums (or discounts) on returns, this predictive power should be in short time spans (remember the optimal lag length of two months).

Next, we ran Dickey–Fuller tests to check whether the series (RPX, RNAV and PR) presented a unit root. We then ran (for each of the funds) Granger causality tests – as is common in the literature – (see, for example, Pradhan *et al.*, 2020) for the three series. The main purpose of causality tests is to determine whether there are some causal relationships among variables and, more specifically, whether lagged variables of (e.g.) PR help predict future values of RPX or RNAV. In short, Granger causality tests allow us to determine whether premiums/discounts show predictive power on returns.

We first ran causality tests for each CEF, and then we aggregate results for all funds to determine, for example, how often PR (Granger) causes RPX or RNAV.

Finally, we estimated impulse response functions. Our focus is to observe how a shock in time t of PR affects returns, thus determining the existence or not of return predictability, the prediction horizon and the direction (or sign) of the impact.

4. Results

Table 4 shows p-values of Dickey–Fuller tests for RPX and RNAV. Both variables are stationary (p-values of 0.000) for the 29 CEFs in the sample.

Figure 1 displays such stationary behaviour for the European Equity Fund (EEA).

On the other hand, PR was stationary for 23 out of the 29 funds (or 79.31%) in the sample. Overall, even though deviations from fundamental value are mean-reverting, there is some evidence of persistent discounts for some funds. Figure 2 shows the mean-reverting behaviour of the premium (or discount) for MXF (Mexico Fund).

We ran the Dickey–Fuller test in first differences for the six non-stationary funds. After differencing, all the six PR series achieved stationarity.

Table 5 presents the results of Granger causality tests. In short, we can see that PR Granger causes RPX for 16 out of 29 funds in the sample. In other words, for 55.17% of the funds, we find evidence consistent with the idea that CEF premiums (or discounts) do carry predictive power on CEF returns. In sum, the market appears to be able to anticipate a fund's future returns using information contained in the premiums (or discounts). This sort of predictability runs against market efficiency (in its weak form). It might be that the deviations from fundamental value capture systematic risk (from a rational perspective), or that deviations reflect behavioural factors (e.g. noise trader risk) that end up manifesting in RPX. We leave the interesting issue of disentangling which type of risk is priced (whether rational or behavioural) for future research.

We also observed that PR Granger causes RNAV for only six (out of 29) funds. In all, we can assert that although premiums or discounts carry some predict power on NAV returns, the predictive power is quite weak (covering only 20.69% of our sample). This result was somewhat expected since NAV returns are more closely related to the performance of fund assets or to managerial abilities to extract returns from those assets.

Ticker	LAGS (1)	LAGS (2)
Panel A: Model 1 – RPX and PR		
AJG	−7.154	−7.266
AJIT	−7.985	−8.128
BGFD	−5.776	−5.925
BGS	−6.656	−6.865
CAF	−6.513	−6.495
EEA	−7.281	−7.265
FJV	−6.855	−6.947
GCH	−4.810	−4.879
GF	−7.952	−8.021
IFF	−6.751	−6.788
IFN	−6.928	−6.936
ISL	−7.602	−7.624
JEQ	−7.285	−7.321
JFJ	−7.757	−7.770
JII	−7.734	−7.845
JMC	−5.819	−5.860
JOF	−6.053	−6.066
JPB	−8.566	−8.561
JPS	−7.278	−7.394
JRS	−8.435	−8.655
MXF	−8.210	−8.211
NAIT	−9.525	−9.616
NII	−7.546	−7.752
SGF	−9.340	−9.398
SJG	−7.757	−7.770
TDF	−6.389	−6.425
TRF	−4.686	−4.698
TWN	−5.039	−5.042
VNH	−5.276	−5.297
# CEFs	3	26
Panel B: Model 2 – RNAV and PR		
AJG	−7.181	−7.274
AJIT	−8.073	−8.133
BGFD	−6.037	−6.155
BGS	−6.679	−6.867
CAF	−6.513	−6.495
EEA	−7.429	−7.415
FJV	−6.837	−6.931
GCH	−4.788	−4.879
GF	−7.964	−8.001
IFF	−6.754	−6.803
IFN	−6.938	−6.951
ISL	−7.546	−7.592
JEQ	−7.385	−7.384
JFJ	−7.151	−7.175
JII	−7.747	−7.860
JMC	−5.844	−5.858
JOF	−6.114	−6.118
JPB	−8.634	−8.578
JPS	−7.277	−7.404
JRS	−8.432	−8.675
MXF	−8.210	−8.211

Table 3.
Optimal number of lags
of our VAR models

Ticker	LAGS (1)	LAGS (2)
NAIT	−9.534	*−9.627*
NII	−7.639	*−7.779*
SGF	−9.365	*−9.378*
SJG	−7.728	*−7.767*
TDF	−6.396	*−6.447*
TRF	−4.624	*−4.698*
TWN	*−5.131*	−5.129
VNH	*−5.915*	−5.886
#CEFs	6	23

Note(s): This table reports Akaike information criterion (AIC) values for our vector autoregressive (VAR) models with one or two lags. For each fund, we report the minimum value of AIC in italic. In the last row, we count the number of funds in which the optimal number of lags is equal to one or two
Source(s): Own elaboration

Table 3.

| Ticker	RPX	RNAV	PR
AJG	0.000***	0.000***	0.179
AJIT	0.000***	0.000***	0.033**
BGFD	0.000***	0.000***	0.000***
BGS	0.000***	0.000***	0.031**
CAF	0.000***	0.000***	0.088*
EEA	0.000***	0.000***	0.000***
FJV	0.000***	0.000***	0.008***
GCH	0.000***	0.000***	0.007***
GF	0.000***	0.000***	0.000***
IFF	0.000***	0.000***	0.270
IFN	0.000***	0.000***	0.190
ISL	0.000***	0.000***	0.074*
JEQ	0.000***	0.000***	0.008***
JFJ	0.000***	0.000***	0.002***
JII	0.000***	0.000***	0.535
JMC	0.000***	0.000***	0.043**
JOF	0.000***	0.000***	0.000***
JPB	0.000***	0.000***	0.054*
JPS	0.000***	0.000***	0.014**
JRS	0.000***	0.000***	0.086*
MXF	0.000***	0.000***	0.028**
NAIT	0.000***	0.000***	0.072*
NII	0.000***	0.000***	0.267
SGF	0.000***	0.000***	0.003***
SJG	0.000***	0.000***	0.002***
TDF	0.000***	0.000***	0.003***
TRF	0.000***	0.000***	0.005***
TWN	0.000***	0.000***	0.000***
VNH	0.000***	0.000***	0.330

Note(s): This table reports MacKinnon p-values for Dickey–Fuller tests of our three main variables. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively
Source(s): Own elaboration

Table 4.
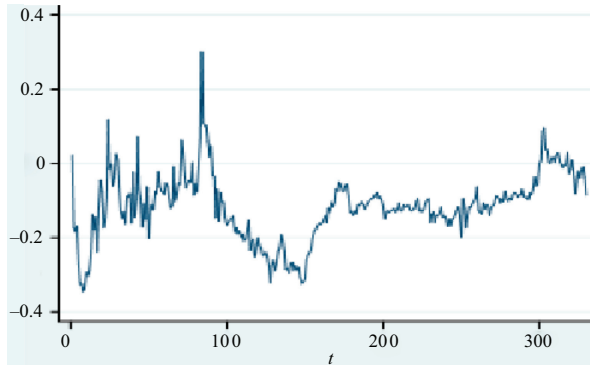Dickey–Fuller test results

Figure 1.
RPX and RNAV for the
European Equity
Fund (EEA)
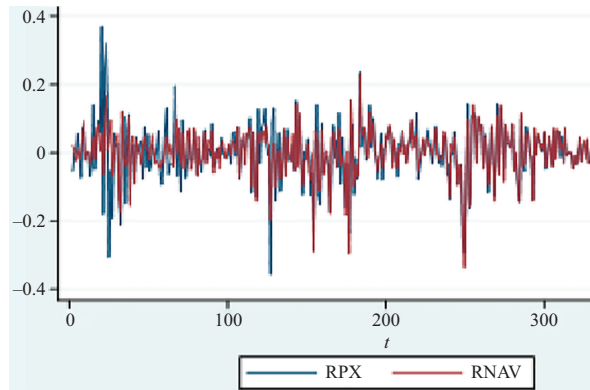
Source(s): Own elaboration

Figure 2.
PR for the Mexico
Fund (MXF)

Source(s): Own elaboration

Appendix 1 presents graphical results for our impulse response function analyses. We study the behaviour of RPX following a shock on PR. With a 5% significance level, we can conclude that there is statistically significant evidence for 23 funds that increase in the premium (or decreases in the discount), negatively impact the future returns of the fund for a short while and then return to their initial level. Figure 3 shows this type of behaviour [i.e. an initial negative impact followed by a non-significant effect (i.e. the confidence interval includes zero) on RPX after a premium (positive) shock] for *Aberdeen Japan Investment Trust* (AJIT).

This finding of negative (positive) returns following discount decreases (increases) is consistent with the idea of mean-reversion in CEF share returns, and also with Swaminathan (1996), Kim and Song (2010), and Jones and Stroup (2010) since CEFs with higher discounts tend to have a higher risk exposure, and their local or target markets are more likely to present higher direct and indirect barriers for investment such as capital controls, political and liquidity risk, macroeconomic instability and information asymmetries among local and foreign investors. In all, if risk exposure dwindles, the premium should increase (or the discount should fall), and consequently, future returns should drop.

Appendix 2 shows the impulse response function graphs to analyse how shocks on premiums or discounts affect NAV returns. By and large, the graphs show mixed and somewhat inconclusive results. We found statistically significant evidence for seven funds

Ticker	F-test	p-value
Panel A: Ho: PR does not Granger cause RPX		
AJG	2.78	0.097*
AJIT	1.33	0.251
BGFD	0.97	0.325
BGS	9.88	0.002***
CAF	0.20	0.653
EEA	4.24	0.040**
FJV	17.64	0.000***
GCH	8.16	0.005***
GF	5.30	0.022**
IFF	1.26	0.263
IFN	2.00	0.158
ISL	6.46	0.012**
JEQ	0.79	0.374
JFJ	1.52	0.219
JII	2.42	0.121
JMC	7.11	0.008***
JOF	0.89	0.345
JPB	0.00	0.986
JPS	3.25	0.073*
JRS	6.65	0.011**
MXF	10.94	0.001***
NAIT	11.96	0.001***
NII	0.73	0.393
SGF	8.82	0.003***
SJG	2.58	0.110
TDF	1.82	0.179
TRF	3.90	0.050**
TWN	3.95	0.048**
VNH	7.47	0.007***
Panel B: Ho: PR does not Granger cause RNAV		
AJG	0.59	0.443
AJIT	1.39	0.239
BGFD	23.77	0.000***
BGS	0.28	0.596
CAF	2.19	0.142
EEA	0.75	0.389
FJV	2.04	0.155
GCH	1.06	0.304
GF	0.05	0.820
IFF	0.75	0.388
IFN	0.15	0.697
ISL	0.19	0.662
JEQ	6.38	0.012**
JFJ	1.67	0.197
JII	0.09	0.763
JMC	0.65	0.419
JOF	14.23	0.000***
JPB	2.7	0.106
JPS	0.32	0.572
JRS	0.56	0.456
MXF	1.23	0.267
NAIT	2.5	0.115

(*continued*)

Table 5.
Granger causality test
results

Ticker	F-test	p-value
NII	0.97	0.326
SGF	0	0.972
SJG	5.61	0.019**
TDF	3.31	0.070*
TRF	0.08	0.784
TWN	9.13	0.003***
VNH	0.03	0.863

Note(s): This table reports F-tests and MacKinnon p-values for Granger causality tests for two (see panels A and B, respectively) null hypotheses (Ho). ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively

Source(s): Own elaboration

Table 5.
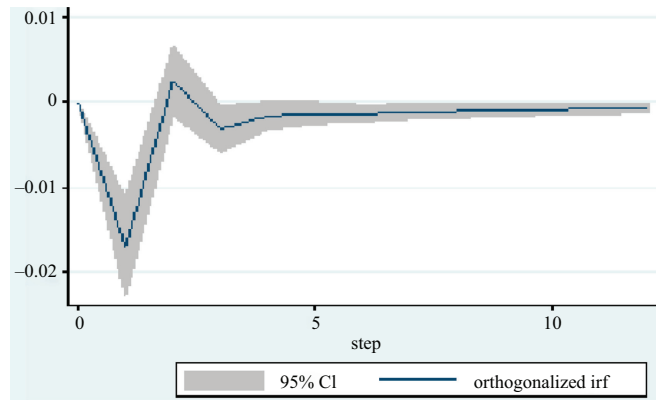
Figure 3.
Impulse (PR) response
(RPX) function (IRF) –
Aberdeen Japan
Investment Trust
Plc (AJIT)

Source(s): Own elaboration

that show that increases in premiums translate into positive impacts on RNAV. Following a premium shock, RNAVs increase and then return to their initial state. This type of behaviour is depicted in Figure 4 for the "Baillie Gifford Japan Trust (BGFD)".

One of the funds presents an opposite behaviour since premium increases lead to NAV returns decreases. For the remaining 21 funds, we were unable to detect the direction of movement given the fact that impulse response functions turned out to be statistically insignificant.

In addition, our results in the two appendices point to the idea that NAV returns are less responsive to shocks than PX returns [evidence in this direction was also found by Frankel and Schmukler (2000)].

5. Discussion and conclusions

This paper analyses the predictive power of premiums (or discounts) on the future share price and net assets returns of a sample of closed-end funds. We find that premiums do have predictive power, and that this is stronger for share price returns than for NAV returns. In essence, we find that the market can anticipate future behaviour because growing premiums forecast declining share price returns for one or two periods ahead. Furthermore, we find that the power of the market to anticipate NAV returns, although weak, is far from inexistent. In this regard, we observe that (with a 5% significance level) in more than 24% of
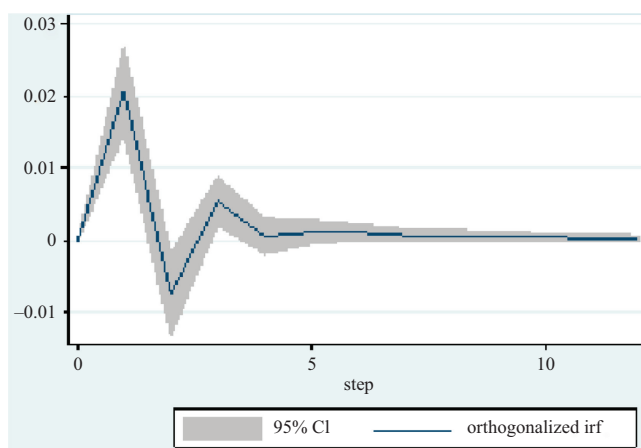
Note(s): CI stands for confidence interval
Source(s): Own elaboration

the funds, growing premiums forecast higher NAV returns one or two months ahead. This finding warrants further research since one would expect NAV returns to be more closely related to the performance of the assets that the fund holds than to the fund's share price performance.

All in all, our results are broadly consistent with the idea of a certain degree of inefficiency in the CEF market because returns are somewhat predictable using information contained in the premiums or discounts. From a rational standpoint deviations from fundamental value capture information on the different types of risks an investor faces, such as direct and indirect investment barriers, capital controls, political and liquidity risk, macroeconomic instability, and information asymmetries between local and foreign investors. Nevertheless, deviations from fundamental value can also be related to behavioural factors such as the existence of non-informed or noise traders that impound a higher level of risk in the CEF market. We leave the interesting issue of distinguishing which type of risk is priced (whether rational or behavioural) for closed-end country funds and including transaction costs in our analyses. In addition to this, implementing a generalized method of moments (GMM) estimation approach (as in Mroua and Trabelsi, 2020) is also in our research agenda. Other worthwhile future research endeavours include the disentanglement of the effect of the 2008 global financial crisis in our results, and like Levy-Yeyati and Ubide (2000), an examination of the divergence of share price and NAVs during crises.

Notes

1. Fletcher (2018) takes the perspective of a UK investor and finds that when short selling is allowed, significant diversification benefits rise when including international CEFs in the opportunity set. When short selling is not possible, the diversification benefits of CEFs fall sharply.

2. Nonetheless, Enders (2014) argues that there is debate whether variables in a VAR model should be stationary or not.

References

Akaike, H. (1974), "A new look at the statistical model identification", *IEEE Transactions on Automatic Control*, Vol. 19 No. 6, pp. 716-723, doi: 10.1109/TAC.1974.1100705.

Alexander, G.J. and Peterson, M.A. (2017), "Short selling and the pricing of closed-end funds", *Journal of Financial Markets*, Vol. 33, pp. 124-142, doi: 10.1016/j.finmar.2016.08.001.

Arias, E. and Torres, C. (2004), *Modelos VAR y VECM para el pronóstico de corto plazo de las importaciones de Costa Rica*, Banco Central de Costa Rica, Documento de Investigación, San Jose, DIE-01-2004-DI.

Davies, R., Fletcher, M. and Marshall, A. (2013), "Investigating the role of illiquidity in explaining the UK closed-end country fund discount", *International Review of Financial Analysis*, Vol. 30, pp. 121-130, doi: 10.1016/j.irfa.2013.07.014.

Davies, R., Fletcher, M. and Marshall, A. (2017), "Time-varying investment barriers and closed-end country fund pricing", *Finance Research Letters*, Vol. 21, pp. 66-71, doi: 10.1016/j.frl.2017.01.004.

Enders, W. (2014), *Applied Econometric Time Series*, John Wiley & Sons, Hoboken, New Jersey.

Fama, E.F. (1970), "Efficient capital markets: a review of theory and empirical work", *The Journal of Finance*, Vol. 25, pp. 383-417, doi: 10.2307/2325486.

Fletcher, J. (2018), "An empirical examination of the diversification benefits of U.K. international equity closed-end funds", *International Review of Financial Analysis*, Vol. 55, pp. 23-34, doi: 10.1016/j.irfa.2017.10.010.

Frankel, J.A. and Schmukler, S.L. (2000), "Country funds and asymmetric information", *International Journal of Finance and Economics*, Vol. 5 No. 3, pp. 177-195, doi: 10.1002/1099-1158(200007).

Jones, S.K. and Stroup, M.D. (2010), "Closed-end country fund premiums and economic freedom", *Applied Financial Economics*, Vol. 20 No. 21, pp. 1639-1649, doi: 10.1080/09603107.2010.524615.

Kim, J.-C. and Song, K. (2010), "Investment barriers and premiums on closed-end country funds", *International Review of Economics and Finance*, Vol. 19 No. 4, pp. 615-626, doi: 10.1016/j.iref.2010.02.001.

Lee, C., Shleifer, A. and Thaler, R. (1990), "Anomalies: closed-end mutual funds", *Journal of Economic Perspectives*, Vol. 4 No. 4, pp. 153-164, available at: https://www.jstor.org/stable/1942727.

Lee, C., Shleifer, A. and Thaler, R. (1991), "Investor sentiment and the closed-end fund puzzle", *The Journal of Finance*, Vol. 46 No. 1, pp. 75-109, doi: 10.1111/j.1540-6261.1991.tb03746.x.

Levy-Yeyati, E. and Ubide, Á. (2000), "Crises, contagion, and the closed-end country fund puzzle", *IMF Staff Papers*, Vol. 47 No. 1, pp. 54-89.

Mroua, M. and Trabelsi, L. (2020), "Causality and dynamic relationships between exchange rate and stock market indices in BRICS countries Panel/GMM and ARDL analyses", *Journal of Economics, Finance and Administrative Science*, Vol. 25 No. 50, pp. 395-412, doi: 10.1108/JEFAS-04-2019-0054.

Pradhan, R., Arvin, M., Norman, N. and Bahmani, S. (2020), "The dynamics of bondmarket development, stockmarket development and economic growth: evidence from the G-20 countries", *Journal of Economics, Finance and Administrative Science*, Vol. 25 No. 49, pp. 119-147, doi: 10.1108/JEFAS-09-2018-0087.

Roenfeldt, R.L. and Tuttle, D.L. (1973), "An examination of the discounts and premiums of closed-end investment companies", *Journal of Business Research*, Vol. 1 No. 2, pp. 129-140, doi: 10.1016/S0148-2963(73)80003-7.

Swaminathan, B. (1996), "Time-varying expected small firm returns and closed-end fund discounts", *The Review of Financial Studies*, Vol. 9 No. 3, pp. 845-887, doi: 10.1093/rfs/9.3.845.

Thaler, R.H. (2016), "Behavioral economics: past, present, and future", *The American Economic Review*, Vol. 106 No. 7, pp. 1577-1600, doi: 10.1257/aer.106.7.1577.

Corresponding author
Luis Berggrun can be contacted at: luis.berggrun@cesa.edu.co

Appendix 1

Source(s): Own elaboration

Appendix 2
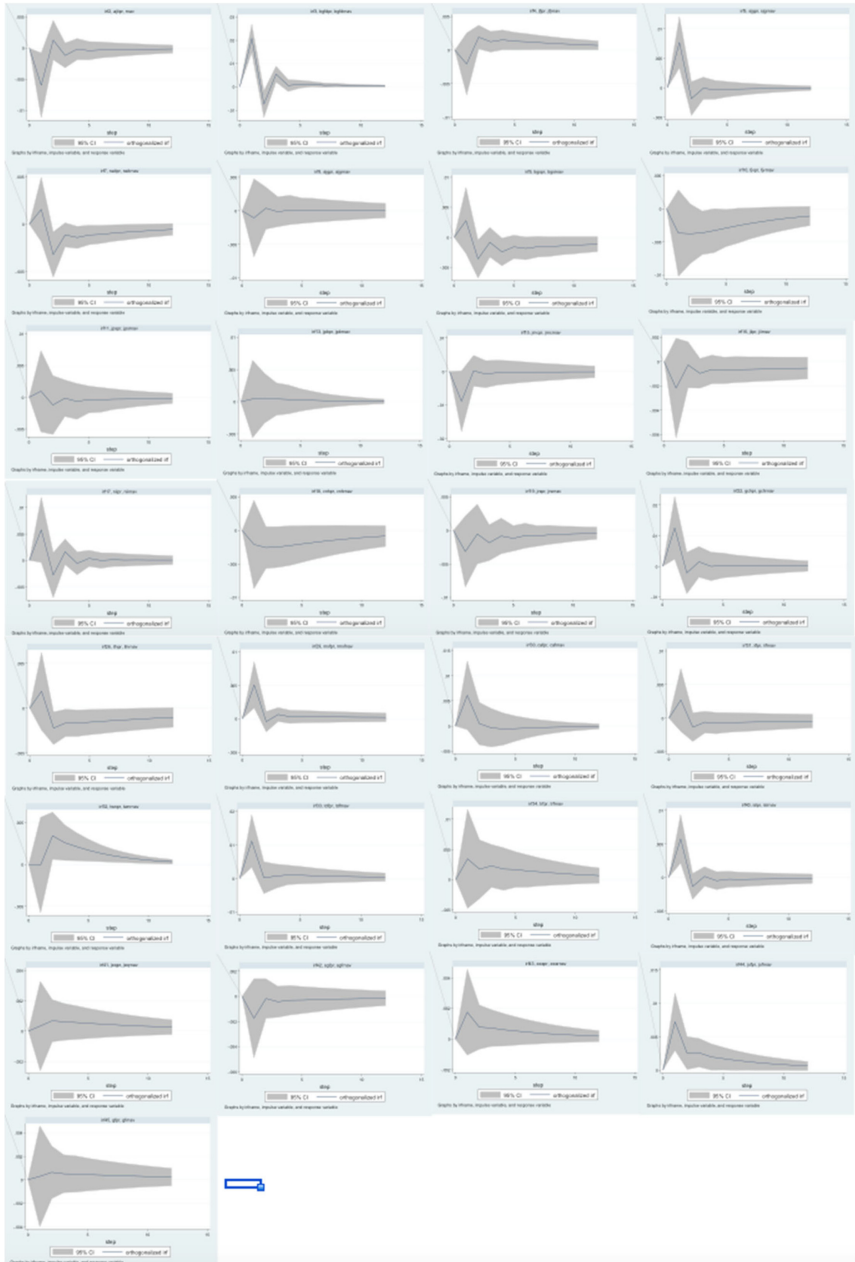
Figure A2.
Impulse (PR) response
(RNAV) functions –
VAR model 2

Source(s): Own elaboration