



# Conditional co-skewness and safe-haven currencies: A regime switching approach

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## ABSTRACT

We examine hedging benefits of safe-haven currencies in terms of currency co-skewness with the global stock market (covariance between currency return and global equity volatility) derived from a Markov regime switching model. Of the major currencies, the US dollar, the Japanese yen and the Swiss franc have positive currency co-skewness, providing a hedge against global stock volatility. Moreover, lower excess returns and associated lower interest rates on these currencies are partially attributable to their positive co-skewness because currency co-skewnesses are significantly priced with the expected negative risk premia. The co-skewness pricing effect remains robust even after allowance for time-varying or downside beta, volatility and skewness.

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## 1. Introduction

Following the Lehman Brothers' collapse and the global financial crisis in 2008, the demand for safe-haven currencies has intensified once more. Safe-haven currencies are those that investors flock to whenever there is a crisis, or merely an outbreak of uncertainty in financial markets, and which provide hedging benefits for a portfolio of risky assets at such times of financial stress (Habib and Stracca, 2012 p.50).<sup>1</sup> More generally, hedging against currency risk is crucial for any long-term global investors (Campbell et al., 2003). In this paper, we explicitly formulate safe haven currencies' presumed hedging properties as their co-skewness with the equity market measured by the covariance between currency excess returns and global equity market volatility. Currency co-skewness directly addresses the essential characteristic of safe-haven currencies, since it refers to currencies with stable performance (as measured by currency returns) during times of financial stress (as measured by global equity volatility).

Currency co-skewness has a strong economic foundation in the skewness preference of investors who consider international equity and currency markets in a broad portfolio.<sup>2</sup> Traditionally, using correlation (or covariance) between the equity and the currency market returns (Glen and Jorion, 1993); (Campbell et al., 2010) or time-varying beta (Christiansen et al., 2011) to evaluate the hedging benefits of currencies is based on mean–variance preferences. In this dimension, investors use foreign currencies to minimize the risk of a diversified portfolio and will buy those currencies that are more negatively correlated with international equity portfolio

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<sup>1</sup> Rinaldo and Soderlind (2010) use a similar definition to underscore (conditional) hedging benefits of safe-haven currencies to the reference asset at the time of stress, while Campbell et al. (2010) (unconditionally) measure such hedging benefits on average.

<sup>2</sup> Typically, the literature on international asset pricing, such as Dumas and Solnik (1995) and De Santis and Gerard (1998), jointly models international equity and currency markets where currency is included as an additional asset class in a broader portfolio.

returns to minimize the expected portfolio's volatility. A limitation of this approach is that the hedging benefits of the currency might not be fully captured by its correlation (or covariance) with the equity portfolio returns because risk is not completely measured when investors do not display mean–variance preferences.<sup>3</sup> A number of theoretical papers demonstrate that investors will seek higher (positive) skewness (Rubinstein, 1973; Kraus and Litzenberger, 1976; Sears and Wei, 1985), and this skewness preference can be based on “prudence” (Kimball, 1990). In the portfolio context, an investor will examine an asset's contribution to the skewness of a broadly diversified portfolio, referred to as “co-skewness” with the portfolio. Currencies with higher co-skewnesses should have more desirable hedging value for the overall portfolio and thus command lower expected returns. By contrast, Brunnermeier et al. (2009) and (Burnside et al., 2010) use currency (idiosyncratic) skewness to capture crash risk. Lustig et al. (2011) and Menkhoff et al. (2012) construct global (equity or foreign exchange) volatility factors. However, these studies do not study hedging properties of currencies from a broadly diversified portfolio point of view. Time varying currency co-skewness is itself a risk factor, which is also different from downside risk (Bali et al., 2009; Lettau et al., 2014) proposed in the literature.<sup>4</sup>

The recent literature has provided supportive empirical evidence that co-skewnesses in stock, bond and option markets are significant determinants of expected returns (Harvey and Siddique, 2000; Dittmar, 2002; Chung et al., 2006; Vanden, 2006; Guidolin and Timmermann, 2008; Yang et al., 2010; Conrad et al., 2013). However, there is not much direct evidence that co-skewness effect is priced in currency excess returns and the associated interest rate differential component, although currency market is substantially larger than most asset markets. This study attempts to fill this gap by evaluating how co-skewness risk is priced in the currency expected returns as a means of identifying safe haven currencies. We find that over the period from 1973 to 2010, the US dollar, the Japanese yen and the Swiss franc have better co-skewness properties than other developed market currencies: they have positive co-skewness with the global equity market whereas other currencies have negative co-skewness. The patterns imply that these currencies are a good hedge against a volatile equity market and therefore less risky than what is suggested by correlation properties (that is, the relatively low or negative correlation with stock returns), as previously explored in Campbell et al. (2010). Thus, these currencies, referred to as safe-haven currencies according to conventional wisdom and recent literature,<sup>5</sup> possess desirable hedging characteristics in terms of currency co-skewness.

We further present the new (and robust) evidence that conditional co-skewness is significantly priced in the currency market both statistically and economically. Using a stochastic discount factor framework, we demonstrate that currency co-skewness with the global stock market is priced in future currency excess returns and commands statistically and economically significant negative risk premia. Given that there is evidence of nonlinear dependence across factors (Cerrato et al., 2017), additional tests based on risk factor models for each currency under consideration indicate that significant currency co-skewness pricing effects are robust even after allowance for time-varying or downside beta, idiosyncratic volatility and skewness effects. Thus, the lower excess returns on the safe-haven currencies can be partially attributed to their desirable hedging properties due to positive co-skewness. The findings support and extend the view that “those currencies that are attractive for risk management purposes would offer lower average returns” (Campbell et al., 2010 p.118).

Equally important, the paper also sheds new light on the possible Granger causal effect of currency hedging on interest rate differentials and more broadly the intricate relationship between exchange rates and interest rate differentials (Engel, 2016; Engel and West, 2005). Habib and Stracca (2012) argue that the interest rate spread is not a fundamental driver of safe-haven currency status, while other studies typically argue that low interest rate currencies are less exposed to risk and thus safer than high interest rate currencies.<sup>6</sup> Using time series regressions, we clearly demonstrate that the positive co-skewness of the safe-haven currencies with the global stock market, an indication of a better hedging property against global stock volatility, is also priced in the future interest rate differential. It demonstrates that a country benefits from having a safe-haven currency because international demand for its Treasury bills reduces the interest cost of financing the government debt (Campbell et al., 2010 p.118). When an economic shock occurs in an integrated global capital market, global equity volatility increases and investors flee to safety, which is likely to be the money and bond markets of safe-haven currency economies. As a result, safe-haven currencies have lower interest rates and resulting lower interest rate differentials, which contribute to lower currency excess returns. Hence, our result extends recent literature on currency pricing and is consistent with Bansal and Dahlquist (2000) and Habib and Stracca (2012).

Following Dumas and Solnik (1995) and De Santis and Gerard (1998), we present a simultaneous modeling of international equity and currency markets where both equity and currency are considered as different asset classes. To our best knowledge, this is also among the first to apply a regime-switching-model-based higher moment estimation method to shed light on the important issue of currency risk premium. Compared with the univariate modeling of either of these two markets separately, the bivariate modeling of both equity and currency markets jointly should be more adequate and result in a more accurate estimation of movements of either of these two markets and particularly the currency market, as more information is used in such modeling, as suggested in the

<sup>3</sup> For example, Campbell et al. (2010, p.89) report the difficulty of explaining carry trade rationally with currency–equity covariance alone.

<sup>4</sup> The “co-skewness” approach has some advantages over downside risk based on extreme value theory and copula as well as other (nonlinear) co-movements used in the recent literature. Firstly, co-skewness can be directly linked to a well-defined skewness preference. Secondly, co-skewness has a more intuitive economic interpretation. In this study, currency co-skewness with a stock market can be explained as the relationship between currency returns and stock market volatility.

<sup>5</sup> Conventional wisdom argues that “When foreign exchange investors felt panicky, they head to, or back to, old faithfuls: the Swiss franc, the US dollar and the Japanese yen”. See “Dollar Stands Out as Safe Haven Currency”, *Wall Street Journal*, December 9th, 2011. In recent literature, there is also separate evidence of safe-haven properties for the US dollar (Maggiori, 2013), Swiss franc and Japanese yen (Ranaldo and Soderlind, 2010), while this study provides consistent evidence to uniformly identify all these safe-haven currencies.

<sup>6</sup> For example, low interest rate currencies are less exposed to global stock market volatility (Lustig et al., 2011) global foreign exchange volatility (Menkhoff et al., 2012), or downside risk (Lettau et al., 2014). While these studies typically hint that low interest rate leads to the safe haven effect, they cannot rule out the reverse causality that low interest rate is due to the pricing effect of safe haven hedging benefits.

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