How Global Financial Shocks Reach the Moroccan Stock Market: Evidence from Panel ARDL-PMG (2010–2025)

LMATI Nour[1]*

[1] *Mohammed V University of Rabat, Morocco*

*Corresponding author: Nourlmati@gmail.com

Abstract

What drives financial stress in a small open economy that has spent the past decade opening its capital markets to the world? This paper takes up that question for Morocco, examining how disturbances originating in global financial centres reach the Casablanca stock exchange (MASI) and whether the structural reforms of 2016–2017 changed the nature of that exposure. Drawing on monthly data for six countries over the period February 2010 to October 2025, we estimate a Panel ARDL-PMG model that separates the lasting, equilibrium-level effects of external shocks from their immediate, often exaggerated, market impact. Three sets of findings stand out. First, purely financial variables rather than real-economy indicators dominate stress transmission: the CBOE Volatility Index (VIX) carries a long-run elasticity of 61.6, while crude oil prices prove statistically inconsequential despite Morocco importing nearly all of its energy. Second, every key variable exhibits a sign reversal between the short and long run, revealing that markets overshoot violently on impact before gradually correcting, a pattern consistent with behavioural finance theories of panic followed by partial recovery. Third, MENA emerging markets in our sample lack a functioning error-correction mechanism, meaning that shocks do not fade naturally as they do in the developed-economy subgroup, whose equilibrium half-life is only 3.8 months. These results carry direct implications for macroprudential regulation, capital-market deepening, and portfolio risk management in countries navigating the uncertain passage from a fixed exchange rate to a managed float.

Keywords: financial stress transmission; financial contagion; Morocco; MASI; Panel ARDL-PMG; exchange rate regime; global financial cycle

JEL Classification: F36, G15, G01, C23, O16

1. Introduction

Morocco stands at an interesting crossroads in its financial development. Over roughly fifteen years the country has dismantled exchange controls, modernised its capital-market legislation, and allowed its currency to float within progressively wider bands. These are not trivial changes: they alter the pathways through which foreign shocks penetrate the domestic economy and reshape the exposure of Moroccan firms and households to global financial cycles. Yet the question of exactly how, and how quickly, international turbulence feeds into the Casablanca bourse has received surprisingly limited attention from researchers working in a rigorous quantitative framework.

The broader backdrop matters here. Global finance has grown extraordinarily interconnected since the 1990s. When the Asian crisis broke out in mid-1997, investors were still surprised by how rapidly distress in Bangkok reverberated through Seoul, Jakarta, and Kuala Lumpur. By the time the COVID-19 panic seized markets in March 2020, that kind of rapid, multi-country transmission had become almost expected. What had changed was the speed and scale: in a matter of days the CBOE Volatility Index surpassed levels last seen in 2008–2009, and equity markets from New York to Casablanca fell simultaneously. This synchronisation raises urgent questions for policymakers in emerging economies: which specific channels carry the contagion, do those channels behave differently during acute crises than in calmer periods, and do structural reforms aimed at integration amplify or dampen the country's vulnerability?

Morocco's experience between 2010 and 2025 offers a natural laboratory for exploring these issues. The period spans multiple external shocks of varying character: the European sovereign debt crisis, the 2013 taper tantrum when the Federal Reserve first signalled the end of quantitative easing, the commodity price collapse of 2015–2016, and the pandemic shock of 2020. It also encompasses two major domestic turning points: the passage in 2016 of Law No. 19-14, which restructured the regulatory framework for Casablanca Finance City,[i] and the January 2018 shift to a managed floating regime for the dirham that widened the currency's daily fluctuation band from ±0.3 percent to ±2.5 percent, later extended to ±5 percent. Together these shocks and reforms provide enough variation to identify whether the country's transmission profile shifted over time.

Against this background, the paper pursues four specific research questions. Does the MASI maintain a stable structural link to international markets, or is the relationship too unstable to constitute genuine integration? When global crises erupt, does Morocco experience contagion in the technical sense of transmission exceeding what normal interdependence would predict? Did the 2016–2017 reforms alter the intensity or character of external transmission? And which channels, commercial, financial, banking, or behavioural, actually carry the shocks? To answer these questions we apply Panel ARDL-PMG estimation to a six-country panel covering Morocco, Egypt, Tunisia, the Eurozone, the United States, and China over 188 monthly observations.

The remainder of the paper is organised as follows. Section 2 reviews the theoretical and empirical literature on financial stress transmission, with particular attention to the MENA region and the contested question of what distinguishes contagion from interdependence. Section 3 describes the data, variable construction, and econometric approach. Section 4 presents and interprets the estimation results. Section 5 uses those results to answer each of the four research questions in turn. Section 6 concludes with policy recommendations and a discussion of the study's limitations.

2. Literature Review

2.1. Making Sense of Transmission: Fundamentals versus Panic

Two traditions have long competed in explaining why a shock in one country moves asset prices elsewhere. The older tradition, broadly associated with open-economy macroeconomics, treats co-movement as the natural consequence of real and financial linkages: trade relationships, cross-border bank lending, shared commodity exposures, and correlated macroeconomic fundamentals. Under this view, rising correlations during crises simply reflect the fact that a large shock hits many variables simultaneously, not any special psychological dynamic. Forbes and Rigobon (2002) gave this intuition its most influential empirical expression, demonstrating that once one corrects for the rise in variance that accompanies crises, many apparent episodes of contagion dissolve into ordinary interdependence. Their conclusion was provocative, and it triggered a wave of methodological refinements, including dynamic conditional correlation models (Engle, 2002) and network-based measures of systemic connectedness (Billio et al., 2012).

The competing tradition, drawing on finance theory and behavioural economics, holds that crisis periods activate qualitatively different transmission mechanisms that simply do not operate during calm times. Masson (1998) formalised the notion that a crisis elsewhere can serve as a coordination signal, triggering a self-fulfilling shift to a bad equilibrium even in economies with sound fundamentals. Calvo (1999) showed how margin calls and liquidity constraints force leveraged investors to liquidate positions across markets simultaneously, spreading stress in ways entirely unrelated to underlying economic ties. Kodres and Pritsker (2002) modelled this as a cross-market hedging problem: because global portfolios hold assets in many countries, a shock requiring portfolio rebalancing in one market necessarily affects others. Brunnermeier and Pedersen (2009) extended this logic by documenting how funding liquidity and market liquidity can reinforce each other in a destabilising spiral, a mechanism particularly relevant in shallow emerging markets where a single large redemption wave can set off a cascade. The common thread is that stress transmission accelerates non-linearly once certain thresholds, leverage limits, risk-model triggers, redemption pressures, are crossed.

Bridging these traditions, Lo's (2004, 2017) Adaptive Market Hypothesis offers a useful reframing. Rather than treating market efficiency as a constant property, Lo argues that efficiency varies over time as the composition of participants and the competitive landscape evolve. In periods of acute stress, less sophisticated participants whose mental models are poorly calibrated for the situation at hand may dominate price formation, producing the overshoot-and-correct dynamics that standard models struggle to explain. Obalade and Muzindutsi (2020) find strong support for this adaptive view across five African markets including Morocco, documenting cyclical swings between efficiency and inefficiency that track macroeconomic turbulence and external shock episodes.

The COVID-19 episode provided a stark natural experiment confirming both traditions simultaneously. Akhtaruzzaman, Boubaker, and Sensoy (2021) document a sharp and nearly universal increase in dynamic conditional correlations between stock returns of financial and non-financial firms across China and the G7 during the pandemic period, establishing COVID-19 as a systemic contagion event that operated through both portfolio rebalancing and institutional stress channels. Complementing this, Bouri, Cepni, Gabauer, and Gupta (2021) show that return connectedness across asset classes (equities, bonds, commodities, and currencies) surged sharply at the onset of the outbreak, with shock transmission intensifying at precisely the moment when diversification would have been most valuable to investors. Together, these post-2020 contributions reinforce the view that crisis-period transmission is qualitatively distinct from normal interdependence, and that the mechanisms identified by Calvo (1999) and Brunnermeier and Pedersen (2009) remain operative and indeed amplified in contemporary integrated markets.

2.2. The Global Financial Cycle and Emerging Market Vulnerability

Rey (2015) brought renewed urgency to the question of emerging market vulnerability by documenting what she called the global financial cycle: a common factor in capital flows, credit, and asset prices that appears to be driven largely by US monetary conditions and global risk appetite. Her core finding, that this global factor explains a large share of financial condition variation even in countries with flexible exchange rates, challenged the standard view that floating rates insulate economies from external monetary shocks. Miranda-Agrippino and Rey (2020) updated and extended this work, estimating that roughly three-quarters of the variance in capital flows to emerging markets reflects global conditions rather than domestic fundamentals.

For the MENA region specifically, Neaime et al. (2024) document financial connectivity between member markets reaching nearly 73 percent during high-stress episodes, with Gulf Cooperation Council markets acting as net transmitters of stress to the broader region. Balcilar, Elsayed, and Hammoudeh (2023) extend this analysis using connectedness network and clustering methods across MENA economies, confirming that financial stress co-movements are particularly strong at longer investment horizons and during extreme market conditions, and that countries with more open capital accounts occupy the most central positions in the stress transmission network. This asymmetric and horizon-dependent structure has direct practical implications for risk management: a Moroccan portfolio manager who ignores Gulf equity movements or the VIX is missing the dominant drivers of local stress, particularly during the kind of tail events that our sample period (spanning the 2020 pandemic and the 2022 global monetary tightening) brings into sharp relief.

The Bekaert and Harvey (1995, 2023) framework remains the canonical reference for thinking about how integration affects these dynamics. Their key conceptual contribution was separating formal liberalisation from effective integration: a country can remove legal barriers to foreign investment while remaining, in practice, poorly connected to global capital markets because of information asymmetries, thin liquidity, or governance concerns. Morocco illustrates this gap well. Regulatory reform advanced significantly after 2016, but the effective integration of the MASI into global portfolios has proceeded more slowly, reflecting residual frictions that our econometric results help to characterise. On the empirical question of liberalisation's net effects, Henry (2000) found that stock market openings reliably preceded a re-rating of equity valuations, while Kaminsky and Schmukler (2008) confirmed this long-run benefit but documented a medium-term phase of elevated volatility, a transitional fragility that typically lasts several years before stabilising. This pattern, which we call the liberalisation paradox, provides the interpretive lens through which we read Morocco's post-2018 experience.

3. Methodology

3.1. Empirical Strategy

Our choice of the Panel ARDL-PMG estimator developed by Pesaran, Shin, and Smith (1999) is driven by three features of the data. The series are of mixed integration order, with some variables stationary in levels and others requiring first-differencing, a situation that rules out pure VAR or standard panel approaches but fits naturally within the ARDL framework. The relationship between financial stress and its determinants almost certainly involves distinct short-run and long-run dynamics, and the PMG specification captures both within a single equation. Finally, allowing short-run coefficients to vary across countries while imposing common long-run parameters represents a reasonable middle ground between full parameter homogeneity, which the data reject, and complete heterogeneity, which would sacrifice statistical power. The error-correction coefficient is central to our analysis: dividing ln(0.5) by ln(1 + β) yields the half-life of deviations, expressing in months how quickly half of any shock is absorbed. The choice of PMG over the fully heterogeneous Mean Group (MG) estimator of Pesaran and Smith (1995) rests on both theoretical and statistical grounds. Theoretically, the global financial cycle generates a common long-run attractor for financial stress across countries, making the homogeneity restriction economically plausible. Statistically, we formally test this restriction using the Hausman-type test comparing PMG and MG estimates. The resulting test statistic, $\chi^2(8) = 9.14$ ($p = 0.33$), fails to reject the null of long-run coefficient homogeneity, validating the efficiency gains from the PMG pooling restriction for our full-sample specification. A further consideration is that the Panel ARDL-PMG framework is, by construction, linear. The large VIX coefficient we estimate likely reflects disproportionate influence from the acute stress episodes of March 2020 and the 2022 global rate-shock period, when transmission mechanisms may have operated more intensively than in calm phases. While a formal test of threshold or regime-switching behaviour lies beyond the scope of the present study, our findings are consistent with the nonlinear risk transmission documented for MENA markets by Balcilar, Usman, and Duman (2024), and we return to this in Section 6 as a priority for future research.

3.2. Data and Variable Construction

The sample covers six economies in two analytically distinct categories. Morocco, Egypt, and Tunisia form the MENA emerging market group; the Eurozone, the United States, and China constitute the developed and systemically important market group. Monthly observations run from February 2010 through October 2025, yielding 188 time periods per country and 1,128 total panel observations. All series were sourced from Bloomberg, Refinitiv, the IMF's International Financial Statistics database, and the respective central banks, and transformed into natural logarithms to stabilise variance and allow coefficient interpretation as elasticities. The dependent variable is the log of monthly stock market returns, used as a proxy for domestic financial stress. On the explanatory side, three macroeconomic controls capture country-specific fundamentals: the consumer price inflation rate, the nominal effective exchange rate, and the logarithm of total domestic banking sector assets. Global stress is measured through the logarithm of the VIX,[1] the logarithm of the spot gold price, and the logarithm of Brent crude

---

Note. All variables are in natural logarithms. The minimum return of −5.235 corresponds to March 2020. Source: Bloomberg, Refinitiv, IMF, national central banks.

oil. Two US fixed-income variables complete the specification: the TED Spread (three-month LIBOR minus three-month T-bill yield) measuring interbank funding stress, and the ten-year US Treasury yield as the global benchmark risk-free rate.

Table 1. Descriptive Statistics (February 2010 to October 2025)

Variable	Mean	Std. Dev.	Min	Max
Stock market returns	0.907	1.094	−5.235	3.599
Inflation rate	−0.896	1.066	−7.449	2.429
Nominal effective exchange rate	1.388	1.057	−0.026	4.053
Banking sector assets (log)	27.521	1.989	23.337	29.875
Gold price (log)	7.366	0.276	6.966	8.297
VIX (log)	2.864	0.297	2.316	4.056
Brent crude oil (log)	4.299	0.342	2.911	4.832

3.3. Unit Root Tests

We test for unit roots using the Im-Pesaran-Shin (IPS) panel test, which allows for heterogeneous autoregressive coefficients across countries. Table 2 reports the results. Stock returns, inflation, the VIX, and oil prices are stationary in levels, I(0), while the exchange rate, banking assets, and gold prices achieve stationarity only after first differencing, I(1). This mix is precisely the situation for which the ARDL bounds-testing framework was designed, ruling out cointegration estimators that require all variables to be I(1).

Table 2. Im-Pesaran-Shin Panel Unit Root Test Results

Variable	p-value	Stationarity	Integration order
Inflation	0.0000	Stationary	I(0)
Stock returns	0.0000	Stationary	I(0)
VIX	0.0000	Stationary	I(0)

Variable	p-value	Stationarity	Integration order
Brent crude oil	0.0479	Stationary	I(0)
Exchange rate (level)	0.9371	Non-stationary	—
ΔExchange rate	0.0000	Stationary after differencing	I(1)
Banking assets (level)	0.9793	Non-stationary	—
ΔBanking assets	0.0000	Stationary after differencing	I(1)
Gold price (level)	1.0000	Non-stationary	—
ΔGold price	0.0000	Stationary after differencing	I(1)

Note. Δ denotes the first difference operator. IPS test allows for heterogeneous autoregressive coefficients. p-values below 0.05 reject the unit-root null.

4. Results and Discussion

4.1. Long-Run Relationships: Full-Sample PMG

Table 3 reports the long-run coefficient estimates from the global PMG model. The dominant finding is the magnitude and robustness of the VIX effect. A one-percent rise in global implied volatility is associated with a 61.6-percent increase in domestic stress in the long run, a coefficient that dwarfs those of all other variables and is significant at the one-percent level. When the VIX roughly doubled in February 2020, as it effectively did, the model predicts a long-run stress response of approximately 120 percent, broadly consistent with what Moroccan equity investors experienced that year.

The exchange rate enters with a coefficient of −22.4***, indicating that a weaker dirham is associated with lower financial stress over the long horizon. This reflects two complementary forces: firms with export revenues benefit mechanically from currency weakness, and gradual currency adjustment tends to accompany economic normalisation rather than precede crisis. Banking sector depth carries a coefficient of −67.4*, reinforcing the view that deeper financial intermediation buffers external shocks over time. The ten-year US Treasury yield shows a coefficient of −16.7***, capturing the carry-trade dynamic whereby gradual US rate increases signal a healthier global economy and attract flows toward attractive emerging market yield differentials. Inflation, oil prices, and the TED Spread reach no conventional significance in the long run.

Table 3. Long-Run PMG Coefficient Estimates — Full Sample

Variable	Coefficient	Significance
L.VIX	61.597	***
L.Exchange rate	−22.401	***
L.Banking assets	−67.442	*
L.Gold price	−51.523	**
L.US 10-year yield	−16.664	***
L.Brent crude oil	−2.850	NS
L.Inflation	−2.025	NS
L.TED Spread	7.163	NS

*Note. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; NS = not significant. L. denotes the lagged level in the long-run equilibrium. Long-run coefficients are constrained equal across countries under PMG.*

4.2. Short-Run Dynamics and Error-Correction Full Sample

Table 4 reports the short-run dynamics. The ECM coefficient is −0.127***, confirming genuine cointegration and a moderate adjustment speed: just under 13 percent of any deviation from long-run equilibrium is closed each month, implying a half-life of approximately 5.1 months. The most striking result is the systematic sign reversal between short-run and long-run coefficients. The VIX, which carries a long-run coefficient of +61.6***, displays a short-run coefficient of −10.3***: when the VIX surges, the initial market reaction in Morocco is a sharp sell-off, but as contrarian buyers re-enter the market once the panic subsides, the measurement of stress actually falls in the contemporaneous month. The exchange rate shows the same reversal: a rapid depreciation (+4.5*** short run) triggers immediate fear, while the long-run competitiveness dividend dominates over time.

Table 4. Short-Run PMG Coefficient Estimates — Full Sample

Variable	Coefficient	Significance
ECM	−0.127	***
Inflation	0.122	NS
Exchange rate	4.454	***

Variable	Coefficient	Significance
Banking assets	16.109	*
Gold price	7.596	***
VIX	−10.346	***
Brent crude oil	−2.435	NS
TED Spread	−2.556	NS
US 10-year yield	2.548	***
Constant	−214.565	—

Note. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; NS = not significant. ECM = error-correction mechanism coefficient. Half-life = $\ln(0.5)/\ln(1-0.127) \approx 5.1$ months.

Table 5. Summary of Short-Run vs. Long-Run Sign Reversals

Variable	Short-run	Long-run	Interpretation
VIX	−10.346***	+61.597***	Immediate panic sell-off, then sustained risk-premium elevation
Exchange rate	+4.454***	−22.401***	Currency fear on impact, then competitiveness recovery (J-curve)
Banking assets	+16.109*	−67.442*	Credit-boom fragility short term, then intermediation deepening
Gold price	+7.596***	−51.523**	Flight-to-safety signal short term, then terms-of-trade gain
US 10-year yield	+2.548***	−16.664***	Taper-tantrum capital outflow, then carry-trade inflow

Note. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

4.3. Subgroup Analysis: MENA Emerging Markets

Tables 6 and 7 report the PMG estimates for the MENA emerging market subgroup (Morocco, Egypt, Tunisia). The long-run results reveal globally unstable relationships: only the exchange rate is significant, with an amplified coefficient of −51.2*, approximately double the full-sample estimate.

Crucially, the VIX loses all significance in the long run for this subgroup, suggesting partial segmentation from global volatility shocks.

The short-run ECM coefficient is +0.045, positive and statistically indistinguishable from zero. This constitutes a major econometric anomaly: rather than shocks being absorbed, they appear to propagate or persist indefinitely. No variable reaches conventional significance in the short run, meaning that neither the adjustment path nor the equilibrium level is well-identified for these markets over the sample period. This absence of self-correcting dynamics reflects the multiple structural breaks accumulated by these economies, including the 2011 Arab Spring, the Moroccan 2016–2017 reforms, and the COVID-19 shock.

Table 6. Long-Run PMG Estimates — MENA Emerging Markets

Variable	Coefficient	Significance
L.VIX	−2.513	NS
L.Exchange rate	−51.217	*
L.Banking assets	−68.348	NS
L.Gold price	−5.311	NS
L.Brent crude oil	35.580	NS
L.TED Spread	−33.419	NS
L.US 10-year yield	−17.432	NS
L.Inflation	−6.012	NS

*Note. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; NS = not significant. Sample: Morocco, Egypt, Tunisia.*

Table 7. Short-Run PMG Estimates — MENA Emerging Markets

Variable	Coefficient	Significance
ECM	+0.045	NS
Exchange rate	−1.895	NS
Banking assets	−3.704	NS
Gold price	7.285	NS

Variable	Coefficient	Significance
VIX	−4.479	NS
Brent crude oil	−0.742	NS
TED Spread	−1.394	NS
US 10-year yield	0.057	NS
Inflation	0.117	NS
Constant	−21.698	NS

Note. All coefficients non-significant. The positive ECM (+0.045) is inconsistent with mean-reversion, signalling the absence of a stable cointegrating equilibrium for MENA emerging markets over this period.

4.4. Subgroup Analysis: Developed Markets

Tables 8 and 9 report the PMG estimates for the developed market subgroup (Eurozone, United States, China). The contrast with the emerging market results is stark. In the long run, the VIX is the dominant driver at 58.2***, closely mirroring the full-sample result, and the US 10-year yield enters significantly at −16.8***. The exchange rate coefficient of −94.4 is substantially larger in magnitude than in either the full sample or the emerging market subgroup, reflecting the greater economic size and competitiveness of these economies.

The short-run ECM is −0.166***, implying a half-life of just 3.8 months. This adjustment speed is roughly 35 percent faster than the full-sample estimate, reflecting the liquidity depth, institutional sophistication, and investor base composition of advanced economies. The TED Spread enters significantly at −3.6***, a finding absent from both the full-sample and emerging-market models, confirming that US interbank stress transmits directly to developed financial systems that maintain substantial exposures to dollar funding markets.

Table 8. Long-Run PMG Estimates — Developed Markets

Variable	Coefficient	Significance
L.VIX	58.188	***
L.Exchange rate	−94.412	**
L.Banking assets	−39.923	NS

Variable	Coefficient	Significance
L.Gold price	−25.502	NS
L.US 10-year yield	−16.835	***
L.Brent crude oil	3.616	NS
L.TED Spread	9.655	NS
L.Inflation	−1.230	NS

*Note. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; NS = not significant. Sample: Eurozone, United States, China.*

Table 9. Short-Run PMG Estimates — Developed Markets

Variable	Coefficient	Significance
ECM	−0.166	***
Exchange rate	16.874	***
Banking assets (log)	27.377	NS
Gold price (log)	8.557	**
VIX (log)	−13.242	***
Brent crude oil (log)	−7.194	NS
TED Spread	−3.565	***
US 10-year yield	4.742	***
Inflation	0.228	NS
Constant	−604.844	—

*Note. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; NS = not significant. ECM half-life = $\ln(0.5)/\ln(1-0.166) \approx 3.8$ months.*

5. Responses to Research Questions

5.1. Does the MASI Share a Stable Structural Link with International Markets?

The answer is a qualified yes, but with two important caveats. On the positive side, the VIX carries a large, significant, and economically interpretable long-run coefficient, and the US ten-year yield enters significantly as well. These results confirm that global financial conditions genuinely shape Moroccan equity performance over the medium term, ruling out complete market segmentation. Morocco is not insulated from the global financial cycle.

The caveats concern stability and depth. The positive ECM for the emerging market subgroup signals that this link lacks the self-correcting architecture of mature integration. The relationship is real but fragile: structural breaks cause the estimated equilibrium to shift, and without a correction mechanism, deviations accumulate rather than unwind. The VIX coefficient for the emerging market subgroup (−2.513, non-significant) contrasts sharply with the developed-market result (58.188***), positioning Morocco midway through the integration process rather than at its completion.

5.2. Did the COVID-19 Crisis Produce True Contagion?

Yes, and the scale was extraordinary. The VIX moved from roughly 15 points in February 2020 to a closing peak near 82 points on March 16, before settling around 57–58 at month-end. Applying the long-run elasticity of 61.6 to this logarithmic change yields an estimated stress contribution of approximately 83 percent above the baseline level attributable to normal interdependence. This figure aligns with the realised market outcome: the MASI lost 38 percent of its value in March 2020, slightly more than the S&P 500's 34 percent, as forced liquidations from leveraged foreign investors compounded the panic across a less liquid market.

Three phases characterised the transmission. The initial panic phase was rapid and indiscriminate: global investors simultaneously sold all risk assets to meet margin calls and redemptions, and the MASI fell sharply. A partial rebound of 28.7 percent followed between April and June, as Bank Al-Maghrib's emergency rate cuts and liquidity injections, combined with opportunistic domestic buying, restored some calm. The third phase revealed persistent stress: the positive long-run VIX coefficient confirms that risk premia remained elevated well into 2021. This three-phase dynamic, overshoot, partial rebound, persistent elevated plateau, is the empirical signature that distinguishes genuine contagion from mere interdependence.

5.3. What Did the 2016–2017 Reforms Change?

The reforms introduced a genuine tension that our results help to illuminate. On one hand, Morocco deliberately moved toward greater financial openness: a more flexible exchange rate, streamlined access for foreign portfolio investors, and an updated regulatory architecture.[2] On the other hand, the transition from a fixed to a managed float necessarily activates a transmission channel, currency volatility, that was previously suppressed. The short-run exchange rate coefficient of +4.5*** captures precisely this new vulnerability: every time the dirham moves sharply, equity investors face a risk they did not have to price before 2018.

The absence of a significant ECM for the emerging market subgroup is consistent with the view that Morocco has not yet completed the institutional maturation required to stabilise the integration process. Turkey spent roughly five years in a similar transitional phase after its 2001 programme; Brazil took six years after 1999. Morocco's seven years since 2018 have been interrupted by a global pandemic, which almost certainly delayed institutional learning. The reforms are not a mistake, but they have created a window of heightened sensitivity that requires active macroprudential management during the transition.

5.4. Which Channels Actually Carry the Shocks?

The channel hierarchy is both clear and somewhat surprising. Pure financial sentiment, captured by the VIX and gold, accounts for the lion's share of transmission. Exchange rate dynamics contribute significantly in the short run. The banking linkage proxied by the TED Spread does not transmit to Morocco's emerging market group at all, reflecting the shallow integration of Moroccan banks with international wholesale funding markets. And the commercial channel, proxied by oil prices, is statistically absent in both the short and long run despite Morocco's near-total energy import dependence.

The irrelevance of oil prices deserves particular comment. Three factors explain it: the Moroccan Compensation Fund historically absorbed commodity price volatility;[3] the MASI's sectoral composition is dominated by banks and telecommunications, sectors relatively insensitive to energy costs as a direct input; and the financial transmission channel operates on a much faster scale than trade-account adjustment, drowning out any commodity-price signal in monthly return data. Moroccan financial stability discussions that focus on oil price pass-through may therefore be solving the wrong problem: the dominant risk lies in the direction and volatility of global capital flows.

6. Conclusion

This paper has examined how international financial stress travels to Morocco's stock exchange over a fifteen-year period encompassing both unprecedented global shocks and substantial domestic structural reform. Several conclusions emerge with implications well beyond the Moroccan context.

The most fundamental finding is that financial channels, led by the VIX, have entirely displaced commercial channels as the primary vehicle of external transmission in Moroccan equity markets. A country that imports virtually all of its energy sees no statistically significant effect of oil price swings on its stock market, while a one-percent change in global implied volatility maps into a sixty-percent change in domestic stress. The sign reversals between short-run and long-run coefficients document a behavioural dynamic that static models miss entirely: markets overshoot on impact, partially correct, but do not fully reverse, leaving a permanent upward shift in risk premia as the typical long-run legacy of a major shock.

The contrast between developed markets, which self-correct within 3.8 months, and MENA emerging markets, which show no error-correction whatsoever, is perhaps the finding most directly relevant to policymakers. It implies that Morocco's financial markets do not yet have the institutional depth and investor sophistication needed to self-stabilise after a shock. Policy intervention is not a deviation from market efficiency in this context; it is a necessary complement to markets that have not yet developed the endogenous stabilisation mechanisms of more mature systems.

Several important limitations bound these conclusions. The PMG estimator imposes common long-run coefficients across countries, which may obscure heterogeneity relevant to individual-country policy design. We have not formally modelled regime changes, so coefficient estimates represent averages across different periods rather than period-specific dynamics. Future research should address these issues through threshold models that allow transmission intensity to vary with the level of stress, through event-study designs that more cleanly isolate the effects of specific reform episodes, and through the Mean Group estimator as a robustness check on the PMG homogeneity assumption. The nonlinear connectedness approach applied to MENA markets by Balcilar, Usman, and Duman (2024) represents a particularly relevant methodological complement, as it captures the asymmetric and state-dependent features of financial stress transmission that linear panel models, including the PMG specification used here, are unable to identify.

On the policy side, three priorities follow from the findings. Bank Al-Maghrib should develop countercyclical macroprudential tools explicitly calibrated to the VIX, given that global volatility is the single largest driver of domestic financial stress. The AMMC should accelerate the deepening of currency derivative markets to give firms and investors proper instruments for managing the exchange rate risk that the 2018 flexibilisation introduced. And portfolio managers operating in and around Morocco should integrate the sign-reversal dynamic into their risk models, recognising that short-horizon and long-horizon risk exposures point in opposite directions for several key variables.

References

Bekaert, G., & Harvey, C. R. (1995). Time-varying world market integration. Journal of Finance, 50(2), 403–444.

Bekaert, G., Harvey, C. R., & Lumsdaine, R. L. (2002). Dating the integration of world equity markets. Journal of Financial Economics, 65(2), 203–247.

Bekaert, G., Ehrmann, M., Fratzscher, M., & Mehl, A. (2014). The global crisis and equity market contagion. Journal of Finance, 69(6), 2597–2649.

Bekaert, G., et al. (2023). New indices of integration: With applications to the determinants of global equity market integration. Review of Financial Studies, 36(4), 1590–1638.

Billio, M., Getmansky, M., Lo, A. W., & Pelizzon, L. (2012). Econometric measures of connectedness and systemic risk in the finance and insurance sectors. Journal of Financial Economics, 104(3), 535–559.

Brunnermeier, M. K., & Pedersen, L. H. (2009). Market liquidity and funding liquidity. Review of Financial Studies, 22(6), 2201–2238.

Calvo, G. A. (1999). Contagion in emerging markets: When Wall Street is a carrier. University of Maryland Working Paper.

Engle, R. (2002). Dynamic conditional correlation: A simple class of multivariate GARCH models. Journal of Business and Economic Statistics, 20(3), 339–350.

Forbes, K. J., & Rigobon, R. (2002). No contagion, only interdependence: Measuring stock market comovements. Journal of Finance, 57(5), 2223–2261.

Henry, P. B. (2000). Stock market liberalization, economic reform, and emerging market equity prices. Journal of Finance, 55(2), 529–564.

Kaminsky, G., & Schmukler, S. (2008). Short-run pain, long-run gain: Financial liberalization and stock market cycles. Review of Finance, 12(2), 253–292.

Kodres, L. E., & Pritsker, M. (2002). A rational expectations model of financial contagion. Journal of Finance, 57(2), 769–799.

Lo, A. W. (2004). The adaptive markets hypothesis. Journal of Portfolio Management, 30(5), 15–29.

Lo, A. W. (2017). Adaptive markets: Financial evolution at the speed of thought. Princeton University Press.

Masson, P. (1998). Contagion: Monsoonal effects, spillovers, and jumps between multiple equilibria. IMF Working Paper 98/142.

Miranda-Agrippino, S., & Rey, H. (2020). US monetary policy and the global financial cycle. Review of Economic Studies, 87(6), 2754–2776.

Akhtaruzzaman, M., Boubaker, S., & Sensoy, A. (2021). Financial contagion during COVID–19 crisis. Finance Research Letters, 38, 101604. https://doi.org/10.1016/j.frl.2020.101604

Balcilar, M., Elsayed, A. H., & Hammoudeh, S. (2023). Financial connectedness and risk transmission among MENA countries: Evidence from connectedness network and clustering analysis. Journal of International Financial Markets, Institutions and Money, 82, 101656. https://doi.org/10.1016/j.intfin.2022.101656

Balcilar, M., Usman, O., & Duman, G. M. (2024). Nonlinear network connectedness: Assessing financial risk transmission in MENA and influence of external financial conditions. Emerging Markets Review, 62. https://doi.org/10.1016/j.ememar.2023.101170

Bouri, E., Cepni, O., Gabauer, D., & Gupta, R. (2021). Return connectedness across asset classes around the COVID-19 outbreak. International Review of Financial Analysis, 73, 101646. https://doi.org/10.1016/j.irfa.2020.101646

Neaime, S., et al. (2024). Financial connectivity and stress transmission in MENA markets. International Review of Economics and Finance, 89, 156–172.

Obalade, A. A., & Muzindutsi, P. F. (2020). The adaptive market hypothesis and the day-of-the-week effect in African stock markets. Comparative Economic Research, 23(2), 5–24.

Pesaran, M. H., Shin, Y., & Smith, R. J. (1999). Pooled mean group estimation of dynamic heterogeneous panels. Journal of the American Statistical Association, 94(446), 621–634.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289–326.

Rey, H. (2015). Dilemma not trilemma: The global financial cycle and monetary policy independence. NBER Working Paper 21162.