San Joaquin County Employees Retirement Association

A G E N D A

BOARD MEETING
SAN JOAQUIN COUNTY EMPLOYEES RETIREMENT ASSOCIATION
BOARD OF RETIREMENT
FRIDAY, JANUARY 21, 2022
AT 9:00 AM

Location: SJCERA Board Room, 6 S. El Dorado Street, Suite 400, Stockton, California

In order to accommodate appropriate COVID-19 protocols and social distancing, no more than ten (10) members of the public will be allowed in the Board Room during the Board Meeting. In accordance with current State mandates, all attendees must wear appropriate face coverings.

The public may also attend the Board meeting live via Zoom by (1) clicking here https://us02web.zoom.us/j/84807983792 and following the prompts to enter your name and email, or (2) calling (669) 219-2599 or (669) 900-9128 and entering Meeting ID 84807983792#.

Persons who require disability-related accommodations should contact SJCERA at (209) 468-9950 or KendraF@sjcera.org at least forty-eight (48) hours prior to the scheduled meeting time.

1.0 ROLL CALL

2.0 PLEDGE OF ALLEGIANCE

3.0 MEETING MINUTES

3.01 Minutes for the Board Meeting of December 10, 2021 4

3.02 Board to consider and take possible action on minutes

4.0 PUBLIC COMMENT

4.01 The public is welcome to address the Board during this time on matters within the Board's jurisdiction, following the steps listed below. Speakers are limited to three minutes, and are expected to be civil and courteous. Public comment on items listed on the agenda may be heard at this time, or when the item is called, at the discretion of the Chair.

If joining via Zoom, Public Comment can be made in the following ways:

PC or Mac: select "Participants" in the toolbar at the bottom of your screen, then select the option to raise or lower your hand.

Mobile Device: select the "More" option in the toolbar at the bottom of your screen, then select the option to raise or lower your hand.

Tablet: select the icon labeled "Participants," typically located at the top right of your screen, then select the hand icon next to your device in the Participants column.

If dialing in from a phone for audio only, dial *9 to "raise your hand."

If attending in person, members of the public are encouraged to complete a Public Comment form, which can be found near the entry to the Board Room.

Except as otherwise permitted by the Ralph M. Brown Act (California Government Code Sections 54950 et seq.), no deliberation, discussion or action may be taken by the Board on items not listed on the agenda. Members of the Board may, but are not required to: (1) briefly respond to statements made or questions posed by persons addressing the Board; (2) ask a brief question for clarification; or (3) refer the matter to staff for further information.

5.0 CONSENT ITEMS

5.01 Service Retirement (35) 8

5.02 General (2)

01 Annual Trustee Education Report 12

02 Earning Codes Retirement-Eligible Ratification Report 13

6.0 INVESTMENT MANAGER PRESENTATION

6.01 Presented by Laura Fahrney and Beth Decker of Ridgemont Equity Partners 15

7.0 CLOSED SESSION

7.01 Purchase or Sale of Pension Fund Investments
California Government Code Section 54956.81

7.02 Threat to Public Service or Facilities
California Government Code Section 54957

7.03 Personnel Matters
California Government Code Section 54957
Employee Disability Retirement Application(s) (0)

7.04 Public Employee Performance Evaluation
California Government Code Section 54957
Title: Retirement Administrator/Chief Executive Officer

8.0 REPORT OF CLOSED SESSIONS

8.01 On November 5, 2021, the Board unanimously approved a proxy vote in favor of consolidation of the structure of the Prologis Targeted U.S. Logistics Fund, L.P. platform and an election to alter the Class A Incentive Period for SJCERA's Class A units.

9.0 CONSULTANT REPORTS PRESENTED BY DAVID SANCEWICH OF MEKETA INVESTMENT GROUP

9.01 Monthly Investment Performance Updates

01 Manager Performance Flash Report - November 2021 29

02 Capital Markets Outlook and Risk Metrics - December 2021 34

9.02 Board to receive and file reports

10.0 STAFF REPORTS

10.01 Pending Retiree Accounts Receivable Report - Fourth Quarter 2021 68

10.02 Disability Quarterly Report - Statistics 69

10.03 Legislative Summary Report - None; No changes since 11/2021

10.04 Trustee and Executive Staff Travel

01 Conferences and Events Schedule for 2022 70

a CALAPRS GA 71

M I N U T E S

BOARD MEETING
SAN JOAQUIN COUNTY EMPLOYEES RETIREMENT ASSOCIATION
BOARD OF RETIREMENT
FRIDAY, DECEMBER 10, 2021
AT 9:00 AM
Location: SJCERA Board Room, 6 S. El Dorado Street, Suite 400, Stockton, California.
Virtual: Via Zoom

1.0 ROLL CALL

1.01 **MEMBERS PRESENT**: Phonxay Keokham, Emily Nicholas, Jennifer Goodman, Michael Duffy (in at 9:02 AM), Katherine Miller (out at 11:13 AM), Chanda Bassett, JC Weydert, Steve Moore, Raymond McCray, and Michael Restuccia presiding

MEMBERS ABSENT: None

STAFF PRESENT: Chief Executive Officer Johanna Shick, Assistant Chief Executive Officer Kathy Herman, Retirement Investment Officer Paris Ba, Financial Officer Carmen Murillo, Management Analyst III Greg Frank, Department Information Systems Analyst II Lolo Garza, Information Systems Specialist II Jordan Regivig, and Administrative Secretary Kendra Fenner

OTHERS PRESENT: Deputy County Counsel Jason Morrish, David Sancewich of Meketa Investment Group

2.0 PLEDGE OF ALLEGIANCE

2.01 Led by Michael Restuccia

3.0 MEETING MINUTES

3.01 Minutes for the Special Board Meeting of November 4, 2021

3.02 Minutes for the Board Meeting of November 5, 2021

3.03 Minutes for the Special Board Meeting of November 17, 2021

3.04 Minutes for the Administrative Committee Meeting of November 17, 2021

3.05 Minutes for the Audit Committee Meeting of December 3, 2021

3.06 **The Board voted (8-0) to approve the minutes of the Special Board meeting of November 4, 2021, the Board meeting of November 5, 2021, the Special Board meeting of November 17, 2021, the Administrative Committee meeting of November 17, 2021, and the Audit Committee meeting of December 3, 2021. (Motion: McCray; Second: Miller)**

4.0 PUBLIC COMMENT

4.01 The was no public comment.

5.0 CONSENT ITEMS

5.01 Service Retirement (12)

5.02 General (2)

01 Retired Member Returning to Active Membership (1)

02 2022 Administrative Budget

a 2022 Budget Summary

b 2022 Administrative Budget Adjustments

c Resolution 2021-12-01 titled “Annual Administrative Budget for 2022”

d Board to consider and take possible action on 2022 Budget and adopt Resolution 2021-12-01

5.03 The Board voted (8-0) to approve the Consent Calendar Items. (Motion: Goodman; Second: Bassett)

6.0 STRATEGIC PLAN UPDATE

6.01 Presentation by Amy McDuffee and Catherine Jackson of Mosaic Governance Advisors

01 Draft Strategic Plan

02 Sample Action Plan

6.02 The Board provided edits and voted (9-0) to approve the amended 2022-2026 Strategic Plan. (Motion: Duffy; Second: Keokham)

7.0 BLOCKCHAIN TECHNOLOGY EDUCATION SESSION

7.01 Presentation by Kinjal Shah of Blockchain Capital

8.0 CONSULTANT REPORTS PRESENTED BY DAVID SANCEWICH OF MEKETA INVESTMENT GROUP

8.01 Quarterly Reports from Investment Consultant for Period Ended September 30, 2021

01 Quarterly Report

02 Manager Certification Report

03 Manager Review Schedule

8.02 Monthly Investment Performance Updates

01 Manager Performance Flash Report - October 2021

02 Capital Markets Outlook and Risk Metrics - November 2021

8.03 Board received and filed reports

9.0 PROPOSED 2022 STRATEGIC INVESTMENT WORK PLAN

9.01 Memo from Meketa Investment Group

9.02 Board received and filed report

10.0 CONTINUATION OF TELECONFERENCING REQUIREMENTS

10.01 Resolution 2021-12-02 titled “Authorization to Continue Teleconferencing for Board and Committee Meetings Pursuant to Government Code Section 54953”

10.02 The motion to adopt Resolution 2021-12-02 to authorize teleconferencing for Board and Committee meetings pursuant to Government Code Section 54953 failed (3-5). (Motion: Duffy; Second: Keokham; Ayes: Nicholas; Nays: Goodman, Restuccia, Bassett, Weydert, McCray)

11.0 STAFF REPORTS

11.01 Legislative Summary Report - None; No changes since 11/2021

11.02 Trustee and Executive Staff Travel

01 Conferences and Events Schedule for 2021-22

02 Summary of Pending Trustee and Executive Staff Travel - none

03 Summary of Completed Trustee and Executive Staff Travel

11.03 CEO Report

In addition to the written report, CEO Shick stated the SJC Mosquito District has determined there is a requirement to meet and confer prior to adoption or implementation of a 2 percent COLA for Tier 2b members. At this time, 3 percent COLA remains in effect for MVCD members.

11.04 Report from Committee(s)

01 Committee Chair and staff will provide a brief summary of the outcome of the:

a Administrative Committee Meeting - November 17, 2021

b Audit Committee Meeting - December 3, 2021

11.05 Board received and filed reports

12.0 CORRESPONDENCE

12.01 Letters Received

12.02 Letters Sent

12.03 Market Commentary/Newsletters/Articles

01 NCPERS Monitor November 2021

02 Coin Center What's a blockchain, anyway? April 2017

03 Pension & Investments Simplicity in investing matters December 2021

13.0 COMMENTS

13.01 Trustee Bassett asked if the *Alameda* Decision implementation would be finalized by end of January 2022

13.02 Trustee Keokham thanked RPESJC for their luncheon on December 9, 2021

13.03 Trustee Nicholas thanked CEO Shick for her update on the Mosquito District postponing their two percent retiree COLA until further notice.

13.04 Trustee McCray asked why the portfolio has underperformed its benchmark. Benchmarka are scheduled for review in the first quarter 2022.

13.05 Chair Restuccia stated he will need to leave the January 21, 2022 Board meeting by 9:40 AM.

14.0 CLOSED SESSION

THE CHAIR CONVENED CLOSED SESSION AT 11:30 A.M. AND ADJOURNED THE CLOSED SESSION AND RECONVENED THE OPEN SESSION AT 11:51 A.M.

14.01 Personnel Matters
California Government Code Section 54957
Employee Disability Retirement Application(s) (1)

01 Consent Items

a Rothy Sok
Mental Health Specialist II
Service Connected Disability

The Board voted unanimously (7-0) to grant the application for a service-connected disability retirement. (Motion: Weydert; Second: Keokham)

14.02 Personnel Matters
California Government Code Section 54957

01 Public Employee Appointment
Title: Assistant Retirement Administrator (Assistant Chief Executive Officer)

County Counsel noted there was nothing to report out of closed session on this item

15.0 CALENDAR

15.01 Board Meeting January 21, 2022, at 9:00 AM

16.0 ADJOURNMENT

16.01 There being no further business the meeting was adjourned at 11:54 AM. The Board took a break from 11:20 AM until 11:30 AM.

Respectfully Submitted:

_____
Michael Restuccia, Chair

Attest:

_____
Raymond McCray, Secretary

San Joaquin County Employees Retirement Association

January 2022

4.01 Service Retirement — Consent

01 KELLY J AARON

Eligibility Worker II
HSA - Eligibility Staff

Member Type: General
Years of Service: 14y 04m 28d
Retirement Date: 9/1/2021

02 SAMUEL A ARONG

Probation Officer
Probation Adult

Member Type: Safety
Years of Service: 08y 09m 06d
Retirement Date: 12/1/2021

03 ARMANDO V CARDENAS

Dept Info Systems Spec III
Hosp Data Processing

Member Type: General
Years of Service: 08y 06m 27d
Retirement Date: 8/31/2021

04 ELAINE S CLARK

Mental Health Specialist II
Mental Health-Adult Outpatient

Member Type: General
Years of Service: 43y 00m 02d
Retirement Date: 10/30/2021

05 ADRIANA M CRUZ

Mental Health Clinician II
Mental Health-Adult Outpatient

Member Type: General
Years of Service: 19y 11m 27d
Retirement Date: 10/29/2021

06 MARIA I DUENAS

Staff Nurse IV - Inpatient
Hosp-CDCR Medical Guarded Unit

Member Type: General
Years of Service: 25y 01m 04d
Retirement Date: 11/1/2021

07 ANA I FARNSWORTH

Eligibility Worker II
HSA - Eligibility Staff

Member Type: General
Years of Service: 23y 05m 00d
Retirement Date: 12/4/2021

08 MARIBEL FLOHRSCHUTZ

Sr Reg Environmental Hlth Spe
Environmental Health

Member Type: General
Years of Service: 19y 07m 05d
Retirement Date: 12/4/2021

09 STACIE L GASKA

Social Worker V
HSA - Services Staff

Member Type: General
Years of Service: 31y 02m 19d
Retirement Date: 11/22/2021

San Joaquin County Employees Retirement Association

January 2022

10 WARREN M GRAY

FD 112 HrEmplRate 1 SM FICA
Lathrop Manteca Fire District

Member Type: Safety
Years of Service: 19y 10m 13d
Retirement Date: 12/3/2021

11 JANE HAUGHT

Staff Nurse III -Inpatient
Correctional Health Services

Member Type: General
Years of Service: 00y 11m 27d
Retirement Date: 11/1/2021
Comments: Deferred with Reciprocity with Calpers

12 YOLANDA F HENRY

Child Support Supervisor
Child Support Svs

Member Type: General
Years of Service: 16y 03m 03d
Retirement Date: 11/7/2021

13 LAWRENCE S HICKS

Appraiser II
Assessor

Member Type: General
Years of Service: 18y 00m 11d
Retirement Date: 12/1/2021

14 SURJIT K JHALLI

Staff Nurse IV - Inpatient
Hosp Intensive Care Nursery

Member Type: General
Years of Service: 33y 11m 27d
Retirement Date: 9/27/2021

15 TERRY L MANZO

Substance Abuse Counselor II
Substance Abuse Services

Member Type: General
Years of Service: 20y 08m 16d
Retirement Date: 10/1/2021

16 SCOTT A MCCARTY

Support Services Technician II
Purchasing - Duplicating

Member Type: General
Years of Service: 18y 04m 16d
Retirement Date: 7/27/2021

17 YOLANDA L MEDINA

Senior Office Assistant
Mental Health - Clerical

Member Type: General
Years of Service: 13y 06m 09d
Retirement Date: 12/1/2021

18 CYNTHIA L MORADY

Accountant III
Child Support Svs

Member Type: General
Years of Service: 23y 04m 12d
Retirement Date: 10/11/2021

San Joaquin County Employees Retirement Association

January 2022

19 PERRY A MORSE

Correctional Officer
Sheriff-Custody-Regular Staff

Member Type: General
Years of Service: 00y 03m 20d
Retirement Date: 12/4/2021

20 PERRY A MORSE

Correctional Officer
Sheriff-Custody-Regular Staff

Member Type: Safety
Years of Service: 21y 01m 18d
Retirement Date: 12/4/2021

21 KATHY D PARKER

Personnel Analyst II
Human Resources

Member Type: General
Years of Service: 24y 08m 13d
Retirement Date: 11/8/2021

22 KIMBERLY D POIRIER

Program Manager
HSA - Admin Support

Member Type: General
Years of Service: 30y 00m 01d
Retirement Date: 11/15/2021

23 LISA K QUEIROLO

Legal Process Clerk III
Court - Oper-Appeals

Member Type: General
Years of Service: 22y 04m 01d
Retirement Date: 12/1/2021

24 RASSELYN T QUIBA

Nursing Assistant
Hosp Labor-Del-Rcvry-Post Part

Member Type: General
Years of Service: 17y 08m 23d
Retirement Date: 11/30/2021

25 MICHAEL S. REESE

Non Member
NA

Member Type: General
Years of Service: 04y 03m 11d
Retirement Date: 12/2/2021
Comments: General After Retirement Split

26 BARRY A RONDINELLA

Airport Director
Stockton Metropolitan Airport

Member Type: Safety
Years of Service: 06y 07m 22d
Retirement Date: 11/19/2021

27 ILANA D SCHIFF-ROSS

First 5 San Joaquin Exec Direc
Children - Families Program

Member Type: General
Years of Service: 29y 01m 23d
Retirement Date: 12/4/2021

San Joaquin County Employees Retirement Association

January 2022

28 DEBORA L SPALDING

Accounting Technician I
HSA - Admin Support

Member Type: General
Years of Service: 22y 05m 15d
Retirement Date: 11/20/2021

29 GREGORY A STAAT

Transfer Truck Driver
SW-Lovelace Transfer Op

Member Type: General
Years of Service: 34y 03m 21d
Retirement Date: 10/25/2021

30 SUZANNE M THOMPSON

Mental Health Specialist II
Mental Health-Adult Outpatient

Member Type: General
Years of Service: 16y 08m 06d
Retirement Date: 10/2/2021

31 SUSAN M TRINCHERA

Manager of Respiratory Care
Hosp Respiratory Care

Member Type: General
Years of Service: 28y 07m 04d
Retirement Date: 9/29/2021

32 YVETTE A URCELAY

Probation Unit Supervisor
Prob-JPCF-Juv Detention

Member Type: Safety
Years of Service: 20y 07m 07d
Retirement Date: 10/2/2021

33 GLORIA VINEY

Nursing Assistant
Hosp Med-Surg 2D

Member Type: General
Years of Service: 21y 06m 19d
Retirement Date: 11/30/2021

34 PAUL D WALLACE

Chief Psychiatric Technician
Mental Health-Older Adult Srvs

Member Type: General
Years of Service: 32y 04m 19d
Retirement Date: 11/1/2021

35 LAURA L WEDDLES

Juvenile Detention Officer
Prob-YOBG-Det-Gender Resp

Member Type: Safety
Years of Service: 15y 00m 02d
Retirement Date: 11/14/2021

2021 ANNUAL BOARD EDUCATION COMPLIANCE REPORT

Government Code Section 31522.8 requires Board Members to complete 24 hours of Board Member education within the first two years of assuming office and for every subsequent two-year period thereafter. Government Code Section 53235.1 requires at least two hours of Ethics training within one year of assuming office and every two years thereafter. Board Policy requires at least two hours of Sexual Harassment Prevention training within six months of assuming office and every two years thereafter.

TRUSTEE	TWO-YEAR PERIOD OF COMPLIANCE	EDUCATION HOURS COMPLETED*	REMAINING HOURS REQUIRED	Ethics Education	Sexual Harassment Prevention Training
Bassett, Chanda **Elected by Safety Members**	07/01/20-06/30/22	29.1	0.0	✓	✓
Duffy, Michael **Appointed by BOS**	01/01/21-12/31/22	10.5	13.5	✓	✓
Goodman, Jennifer **Elected by General Members**	07/01/21-06/30/23	19.8	4.2	✓	✓
Keokham, Phonxay **Ex-Officio Member**	09/17/20-09/16/22	46.8	0.0	✓	✓
McCray, Raymond **Appointed by BOS**	01/01/21-12/31/22	17.9	6.1	✓	✓
Miller, Katherine **Appointed by BOS**	09/15/21-09/14/23	0.7	23.3	✓	✓
Nicholas, Emily **Elected by General Members**	07/01/20-06/30/22	69.0	0.0	✓	✓
Moore, Steve **Alternate Retired Member**	07/9/21-07/8/23	25.5	0.0		✓
Restuccia, Michael **Appointed by BOS**	01/01/21-12/31/22	15.9	8.1	✓	✓
Weydert, JC **Elected by Retired Members**	07/01/21-06/30/23	10.0	14.0		

* Education hours are based whether the topics comply with GC Section 31522.8, 53235.1 and SJCERA's Trustee Education Policy.

Updated December 2021

Board of Retirement Meeting
San Joaquin County Employees' Retirement Association

Agenda Item 5.02-02

January 21, 2022

SUBJECT: Compensation Earnable and Pensionable Compensation for SJCERA Members

SUBMITTED FOR: __X_ CONSENT __ ACTION __ INFORMATION

RECOMMENDATION

Staff recommends the Board ratify the new 2021 retirement-eligible earnings codes in Attachment I.

PURPOSE

To ratify the 2021 earnings codes, which staff included as retirement-eligible compensation, pursuant to the *Retirement-Eligible Compensation* policy.

DISCUSSION

In accordance with the *Retirement-Eligible Compensation* policy, throughout the year staff reviewed compensation items received from participating employer(s) and included those items that were substantially the same as other, previously Board-approved compensation types as Retirement Eligible Compensation.

The County Payroll Manager provided SJCERA staff the information required to evaluate the new 2021 earnings codes for retirement eligibility, as provided in Attachment I. Staff has evaluated the earnings codes in Attachment I and determined the earnings codes to be substantially the same as other codes the Board previously approved.

ATTACHMENTS

2021 Earnings Code Retirement-Eligible Ratification Report

JOHANNA SHICK
Chief Executive Officer

GREG FRANK
Management Analyst III

ATTACHMENT I

2021 EARNINGS CODE RETIREMENT-ELIGIBLE RATIFICATION REPORT

Per the Retirement-Eligible Compensation Policy, the Board shall annually adopt and revise a resolution designating which compensation types shall be included in Retirement-Eligible Compensation

DATE	EARNINGS PAY CODE	DESCRIPTION	(TIER 1) COMPENSATION EARNABLE	(TIER 2) PENSIONABLE COMPENSATION	WORKSHEET SUBMITTED BY COUNTY PAYROLL
Mar-21	ONR	Used in conjunction with OBR/ORT to pay .5 times the employee's hourly rate over and above normal	N	N	Y
Apr-21	ETS	OSHA's Emergency Temporary Standards related to COVID	Y	Y	Y
Apr-21	SPS	Gov. Newsom COVID related supplemental sick leave bill SB 95	Y	Y	Y
Apr-21	LOM	Nurses COVID related Administrative Leave Bank	Y	Y	Y
Apr-21	ASA	Nurses temporary COVID pay for 1st extra shift (outside normal working hours)	N	N	Y
Apr-21	ASB	Nurses temporary COVID pay for 2nd extra shift (outside normal working hours)	N	N	Y
Apr-21	ASC	Nurses temporary COVID pay for 3rd extra shift (outside normal working hours)	N	N	Y
Jul-21	A4Z	Return to worksite pay while on standby	N	N	Y
Jul-21	R4Z	Retro pay for return to worksite pay while on standby (A4Z)	N	N	Y
Jul-21	ASO	Juvenile Detention Facility - administrator on call pay	N	N	Y
Aug-21	A5E	Standby pay for OR technicians	N	N	Y
Aug-21	R5E	Retro pay for standby pay for OR technicians (A5E)	N	N	Y
Aug-21	A5F	Holiday pay for Standby OR technician	N	N	Y
Aug-21	R5F	Retro pay for standby OR technician holiday pay (A5E)	N	N	Y
Dec-21	A5G	Probation employees who are authorized to carry a firearm shall receive an additional 2.5% of base pay.	Y	Y	Y
Dec-21	P5G	Overtime pay for Probation employees authorized to carry a firearm (A5G)	N	N	Y
Dec-21	Q5G	Holiday pay for Probation employees authorized to carry a firearm (A5G)	Y	Y	Y
Dec-21	R5G	Retro pay for Probation employees authorized to carry a firearm (A5G)	Y	Y	Y
Dec-21	A5H	Probation employee designated as Range Master shall receive an additional 5% of base pay.	Y	Y	Y
Dec-21	P5H	Overtime pay for Probation employee designated as Range Master (A5H)	N	N	Y
Dec-21	Q5H	Holiday pay for Probation employee designated as Range Master (A5H)	Y	Y	Y
Dec-21	R5H	Retro pay for Probation employee designated as Range Master (A5H)	Y	Y	Y
Dec-21	A5I	Probation Firearms Instructors shall receive an additional 2.5% of base pay.	Y	Y	Y
Dec-21	P5I	Overtime pay for Probation Firearms Instructors (A5I)	N	N	Y
Dec-21	Q5I	Holiday pay for Probation Firearms Instructors (A5I)	Y	Y	Y
Dec-21	R5I	Retro pay for Probation Firearms Instructors (A5I)	Y	Y	Y
Dec-21	A5J	Probation employees assigned Field Training Officer duties shall receive an additional 2.5% of base pay.	Y	Y	Y
Dec-21	P5J	Overtime pay for Probation employees assigned Field Training Officer duties (A5J)	N	N	Y
Dec-21	Q5J	Holiday pay for Probation employees assigned Field Training Officer duties (A5J)	Y	Y	Y
Dec-21	R5J	Retro pay for Probation employees assigned Field Training Officer duties (A5J)	Y	Y	Y

Ridgemont EQUITY PARTNERS™

REP IV Overview – January 2022

FOR PROFESSIONAL/ QUALIFIED/ INSTITUTIONAL CLIENTS

RIDGEMONT ("REP") AT A GLANCE

(As of 12/31/21)

Mid Market
US BUYOUT & GROWTH
Typical investments of $100-150MM

28-year
TRACK RECORD
Team Spinout in 2010 from Bank of America

3.4x
GROSS MOIC
From Realized Flagship Fund Investments*

8%
TOTAL GP COMMITMENT
Across Funds

$3.0B
DEPLOYED

$3.7B
GROSS PROCEEDS

Since 2010 Across Flagship Funds

$750MM
L.P. EQUITY CO-INVEST
Over the last 5 Years

DEEP SECTOR EXPERTISE

- Business & Tech-Enabled Services
- Industrial Growth
- Healthcare

- Long tenured and close-knit team based in Charlotte, North Carolina
- Deeply researched sectors and priority subsectors driving investment activity
- Preferred partner philosophy to building long-standing relationships with management teams and founders
- Strong growth bias with goal of building larger, strategically-valuable businesses

Please see Defined Terms and Endnotes.
*Flagship Funds include REP I, REP II, and REP III

LONG-TENURED, EXPERIENCED SENIOR LEADERSHIP TEAM

INVESTMENT COMMITTEE

Management Committee

Rob Edwards *Managing Partner (23)*

Jack Purcell *Managing Partner (20)*

John Shimp *Managing Partner (20)*

Travis Hain *Chairman (28)*

Walker Poole *Vice Chairman (28)*

George Morgan *Senior Advisor (23)*

Charles Anderson *Partner (8)*

Anthony Cassano *Partner (3)*

Tim Dillon *Partner (11)*

Cay Freihofer *Partner (12)*

Dan Harknett *Partner (6)*

Ryan Jack *Partner (4)*

FUNCTIONAL LEADS

Origination & Capital Markets (OCM)

Justin Lay *Partner (1)*

Kelly Lineberger *Partner (11)*

Portfolio Operations

Matt Ibbetson *Partner (6)*

Investor Relations

Laura Fahrney *Partner (9)*

Finance & Firm Operations

Ed Balogh *COO (25)*

Jane Caldwell *CAO (1)*

(Denotes Years at REP and Predecessors)

MANAGEMENT COMMITTEE

- Includes three Managing Partners with an average of 20 years working together
- Sets strategic direction for the firm
- Oversees six operational committees with next-gen leaders

INVESTMENT COMMITTEE

- Average of 16 years working together
- Proprietary scoring system to guide investment decisioning
- Highly aligned with investor partners with continued significant GP investment in Fund IV

FULLY BUILT-OUT ORGANIZATIONAL STRUCTURE

- Team of 59 with very low turnover and “employer-of-choice” mindset related to talent development
- OCM: 20+ year effort
- Portfolio Operations: Growing area of team investment
- IR: 10+ year investor partnerships; high-touch model
- Finance & Firm Operations: 10-person team with rigorous processes built over 17 years at Bank of America

NOTE: Please see Defined Terms and Endnotes.

CONSISTENTLY STRONG PERFORMANCE

(As of 9/30/21PF)

Ridgemont

	1993-2010+	REP I (2012)	REP II (2015)	REP III (2019)	REP IV (2022)
	Bank of America				
SIZE	$2.9B+ Deployed	$735MM	$995MM	$1.65B	$2.0B Target
# PLATFORMS	54	17	24	18 ~90% Committed / ~80% Invested	15-20 Anticipated
ALL INVESTMENTS Gross MOIC / IRR	2.3x / 23%	3.0x / 35%	2.0x / 28%	1.8x / 65%	
Net MOIC / IRR	2.0x / 17%	2.5x / 25%	1.7x / 20%	1.6x / 59%	
REALIZED INVESTMENTS Gross MOIC / IRR	2.3x / 23%	3.8x / 44%	2.5x / 43%	6.0x / 94%	

NOTES: Please see Defined Terms and Endnotes. Past performance is not indicative of future results and there is a possibility of loss in connection with an investment in the Fund. Please refer to REP IV PPM and data room for detailed fund track record information. Realized investments include partially realized investments. REP II and REP III use a fund-level line of credit: the Net IRR is greater than it would have been without the use of this line of credit.

+ The statistics shown in this timeframe represent REP's middle market ("MM") track record prior to the 2010 Spinout while members of the current Ridgemont team were part of Banc of America Capital Investors (BACI) and its predecessors. $2.9B represents total invested capital across strategies prior to Spinout, with $1.3B of the $2.9B deployed in the MM strategy. For the avoidance of doubt, all other figures shown in the 1993-2010 timeframe represent the MM track record prior to Spinout.

STRATEGY

INVESTMENT STRATEGY PROVEN OVER THREE DECADES

THEMATICALLY DRIVEN, SECTOR-FOCUSED INVESTORS

- Meta trend observation and analysis translated into investable private equity themes
- Current themes: data proliferation, global trade & logistics, healthcare access & cost, sustainability

IDENTIFYING **SUBSECTORS & BUSINESS MODELS** WITH SPECIFIC CHARACTERISTICS

- Fragmented industries with consolidation potential, often 2-3x GDP growth within subsectors
- Experience with service, distribution, and tech-enabled businesses

POSITIONING AS **PREFERRED PARTNERS**

- Strong culture, high level of alignment, deep investment in relationship development
- Consistently ranked a top 50 founder-friendly PE firm
- ~60% of investments are first time institutional capital or management re-backs

ACCELERATING **GROWTH** AND **PROFESSIONALIZATION** OF BUSINESSES

- Foundation building focused on people, systems, & capabilities
- High ROIC/ROE capital spending and M&A to drive growth
- Driving efficiencies with internal and external resources

BUILDING LARGER AND **STRATEGICALLY VALUABLE** BUSINESSES AT EXIT

- 79 investment realizations since partnership founded in 1993, generating proceeds of $6.6B with ~67% from strategic exits
- 17 REP Flagship Fund exits since 2010 to strategics at ~$12B of total Enterprise Value, >3x going in EV

NOTE: Please refer to Defined Terms and Endnotes.

EXAMPLE OF INVESTMENT STRATEGY IN ACTION: THIRD PARTY LOGISTICS ("3PL") SUBSECTOR

THEMATICALLY DRIVEN, SECTOR-FOC
INVESTORS

IDENTIFYING **SUBSECTORS** & CO MPA
SPECIFIC CHARACTERISTICS

POSITIONING AS **PREFERRED PARTNERS**

ACCELERATING **GROWTH** AND
PROFESSIONALIZATION OF BUSINESSES

BUILDING LARGER AND
STRATEGICALLY VALUABLE BUSINESSES AT EXIT

Trend Observation & Research

META TRENDS
- Increasing globalization
- eCommerce Tailwinds

INVESTABLE THEMES
- Growing supply chain
- Supply chain complexity
- Technology's increased role

2013

Sourcing and Portfolio Creation

WORLDWIDE EXPRESS · eShipping · TransportationInsight · SEKO · Omni Logistics ALL IN. · GLOBALTRANZ · NTG · UNISHIPPERS

$1+ Billion Deployed* in the 3PL Sector

Results – 3PL Track Record*

Current 3PL Portfolio Companies

>$7B
REVENUE

>$800MM
EBITDA

4 Realized Investments
3.7x MOIC / 38% IRR

2.5x MOIC / 43% IRR
(8 Investments Total)

*As of 9/30/21PF, including REP-led co-Investments.
NOTE: Please refer to REP IV PPM and datasite for information on all Ridgemont investments and detailed track records. Please see Defined Terms and Endnotes.

ROBUST SOURCING ENGINE

INTEGRATED APPROACH

REP Sector Teams

- Business & Tech-enabled Services
- Industrial Growth
- Healthcare

+

Origination & Capital Markets Team (est 2002)

Justin Lay *Partner*

Kelly Lineberger *Partner*

Sam Poole *Sr. Associate*

Donny Harrison *Sr. Advisor*

CAPABILITIES

Proactive and Extensive Outreach

1,000+
Average Business Development Touchpoints

~2,000
Opportunities Sourced Annually

350+
Discrete Deal Flow Sources

$10B
Forward Pipeline Opportunity

Preferred Partner Approach

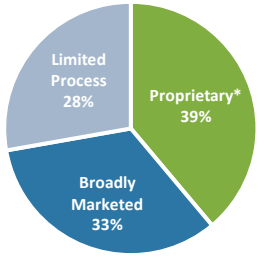
Proactive engagement & cultural alignment

3+ Years
Average Gestation Period for REP III Platforms

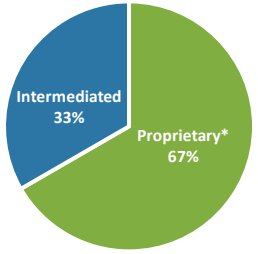
Inc.'s Top 50 Founder-Friendly Private Equity Firms

Results

REP III Platforms (18)



Flagship Fund Add-ons (96)
REP I-REP III



6.1x Average EV/EBITDA

Note: Please see Defined Terms and Endnotes.
*Proprietary transactions defined as situations with no sell-side banker involved.

PORTFOLIO COMPANY VALUE CREATION EFFORTS

INTEGRATED APPROACH

REP Sector Teams

- Business & Tech-enabled Services
- Industrial Growth
- Healthcare

Portfolio Operations Team

Matt Ibbetson	Kyle Greer	Tom Polak	Keegan Good
Partner	*VP*	*Sr. Associate*	*Analyst*

>100 unique consultants & outside execs introduced to REP portfolio companies

KEY LEVERS

Professionalize Companies

- Partner with management teams to identify, quantify, prioritize, execute and track value creation initiatives
- Improve/expand company leadership
- Professionalize systems and management processes to PE standards

>125
Executives Hired

~$125MM
in technology investment

Recent Portfolio Projects

HEALTHMARK GROUP · unison THERAPY SERVICES · DICKINSON FLEET SERVICES

Accelerate Earnings Growth

- Provide corporate development expertise and add-on deal flow
- Draw upon expertise of consultant & advisor network built over three decades
- Reduce direct costs through in-house sourcing and supply chain expertise
- Guide prudent, high-return capital investing

96
Add-ons Completed

6.1x
Avg. EV/EBITDA Multiple

>$1B
Growth Capex invested across the portfolio

Recent Portfolio Projects

Unite PRIVATE NETWORKS · MUNCH'S SUPPLY EST. 1956 WE MAKE IT EASY · SPARUS

NOTE: Please see Defined Terms and Endnotes. All figures on this slide exclude upstream, midstream and royalty companies because REP believes that these metrics are generally not applicable for such investments given the nature of their underlying characteristics. Past performance is not indicative of future results and there is a possibility of loss in connection with an investment in any fund. Please refer to REP IV PPM and datasite for information on all Ridgemont investments and track record detail.

SUMMARY

Nearly 3 decades in the U.S. middle market

- Large team with strong institutional framework
- Well-honed investment strategy underpinned by deep sector expertise
- Preferred partner culture/mindset

Consistently strong investment results

- Over $3B* invested in 54 platform investments since 2010 Spinout
- Multi-decade track record of peer and public outperformance
- 3.4x gross MOIC / 45% gross IRR on exits across REP Flagship Funds since 2010+

Positioned for continued momentum in REP IV

- Fully built out team with actionable forward investment pipeline
- Expanding toolkit to drive portfolio value
- Energized team with focused go-forward sector strategy

Note: Information as of 9/30/21. Please refer to Defined Terms and Endnotes. Past performance is not indicative of future results and there is a possibility of loss in connection with an investment in the Fund. Detail on all Ridgemont investments and track records are available on the REP IV datasite.

* Includes REP-led co-investments.

+ Represents all realized investments across REP Flagship Funds.

DEFINED TERMS AND ENDNOTES

DEFINED TERMS AND ENDNOTES AS OF 9/30/21

NOTES:

Past performance is not indicative of future results and there is a possibility of loss in connection with an investment in any REP Fund. No discussion with respect to specific companies should be considered a recommendation to purchase or sell any particular security/investment. The companies discussed do not represent all past investments. It should not be assumed that any of the investments discussed were or will be profitable, or that recommendations or decisions made in the future will be profitable. Historical investment information provided herein reflects the investment strategies of prior REP Funds. REP IV will not participate in these investments, and they are provided only as indicative examples of prior investments by REP Funds.

Contains forward-looking statements that are based upon certain assumptions made by Ridgemont about future events or conditions and are intended only to illustrate hypothetical results under those assumptions (not all of which are specified herein). There can be no assurance that such projections will materialize as described and actual results may in fact differ, materially.

Financial indicators and benchmarks assume reinvestment of income, are unmanaged, and often do not reflect the deduction of transaction costs, management fees, or other costs which would reduce returns. Such indicators and benchmarks are included for illustrative purposes only and have material inherent limitations when used in comparison to the returns of a REP fund because they may have volatility, credit or other material characteristics that are fundamentally different from those of the REP fund.

DATE:

Except as otherwise expressly noted, all information contained herein describing the performance of investment portfolios is as of September 30, 2021, pro forma for material investment and exit activity through 12/31/21. Information on pro forma adjustments available upon request.

REP HISTORY & BAC PERFORMANCE

Starting in 1993 and for the following 17 years, Ridgemont principals invested as a captive private equity group within Bank of America Corporation ("BAC") and its predecessors. During this time, the group deployed $2.9 billion in 108 private equity investments spanning various strategies and as a GP managed them on behalf of its limited partner, BAC. During this time, the middle market buyout and growth investing strategy ("MM") represented the core activity and investment strategy; additionally, the principals were responsible for large cap co-investing and other ancillary strategies, including mezzanine and venture investing ("Legacy Merchant Banking Activity").

In July 2010, Ridgemont became an independent private equity firm (the "Spinout"). Post-Spinout, Ridgemont's core strategy remains focused on middle market buyout and growth investing, represented by the companies in REP's Flagship Funds (defined below). Collectively, the pre- and post-Spinout middle market buyout and growth strategy (i.e. 1993-present) is referred to herein as "REP MM".

REP retains management authority over remaining BACI investment portfolios (all currently in wind down). However, for the avoidance of doubt, BAC is not an investor in any Ridgemont fund raised post-Spinout and owns no interest in the management company.

REP MM and Legacy Merchant Banking Track Records:

Gross IRRs and Gross MOICs in all cases are based on actual asset-level cash flows, plus unrealized fair market value where applicable, and are calculated before giving effect to management fees, the General Partner's carried interest and other fund-level expenses, the application of which would reduce such prior performance and indicated rates of return. The Net IRRs and Net MOICs are estimates based on gross-to-net differentials ("Differentials") derived from numerous synthetic fund simulations incorporating economics similar to a typical private equity fund including a 2% management fee, an 8% preferred return and a 20% carried interest expense. More detail available upon request.

REP MM Performance: The aggregate Gross MOIC and Gross IRR for REP MM strategy are 2.2x and 24%, respectively. Based on the Differentials, the aggregate Net MOIC and Net IRR are 1.7x and 18%, respectively.

Legacy Merchant Banking Performance: The aggregate Gross MOIC and Gross IRR for the Legacy Merchant Banking strategy are 1.8x and 13%, respectively. Based on the Differentials, the aggregate Net MOIC and Net IRR are 1.5x and 8%, respectively.

DEFINED TERMS AND ENDNOTES AS OF 9/30/21

FLAGSHIP FUNDS

- **RIDGEMONT EQUITY PARTNERS I, L.P. ("REP I"):** In 2013, REP I closed with $735MM of capital commitments.
- **RIDGEMONT EQUITY PARTNERS II, L.P. ("REP II"):** In 2015, REP II closed with $995MM of capital commitments. On April 28, 2017, REP II transferred 50% of five energy investments (including unfunded capital commitments and funded capital) to the EOF at cost plus an interest factor ("ticking fee") of eight percent per annum. The REP II track record performance figures outlined herein account for the five energy investments sold to the EOF as if REP II only invested the amount it retained after the sale.
- **RIDGEMONT EQUITY PARTNERS III, L.P. ("REP III"):** In 2018, REP III closed with $1.65B of capital commitments. The first investment in REP III was made in January 2019.

OTHER FUNDS

- **RIDGEMONT EQUITY PARTNERS ENERGY OPPORTUNITY FUND, L.P. ("EOF"):** In 2017, EOF closed with $320MM of capital commitments. EOF is a companion fund to REP II and REP III and makes side-by-side investments in upstream, midstream and energy and power related service companies.
- **RIDGEMONT PARTNERS SECONDARY FUND I, L.P. ("RPSF"):** In 2012, RPSF was formed with $460MM of capital commitments. RPSF is a portfolio of assets managed by Ridgemont professionals that was divested by BACI in a secondary transaction, whereby such assets were managed by REP on behalf of new limited partners. RPSF has one remaining investment in Indigo Natural Resources, which is pending exit.

PERFORMANCE / TRACK RECORD NOTES

- **INVESTED CAPITAL** equals capital invested in portfolio companies and excludes formation expenses and start-up capital associated with inactive platform companies to the extent there were no investments made in operating assets.

  Note re: REP I: four of the REP I investments were initially funded by Bank of America in a warehousing capacity. At the formation of REP I, warehoused investments were transferred to REP I at cost. For purposes of the contents herein, the invested capital figures represent the amounts and timing of REP I's investment in the companies (i.e. the time of transfer). The aggregate gross IRR for assets in REP I when considering actual investment dates (versus date of transfer) is 33%.
- **RESERVED CAPITAL** equals legally binding funding commitments and/or capital Ridgemont has reserved for follow-on investments for its portfolio companies.
- **REALIZED VALUE** figures include proceeds generated from dispositions and distributions of cash, dividends and interest relating to total Invested Capital, as well as cash interest income at the fund level. Realized Values for unrealized investments are primarily attributable to tax distributions. Unless otherwise noted, Realized Values are for investments herein are as of 9/30/21.
- **UNREALIZED VALUE:** is the estimate of fair market value of remaining investments in accordance with GAAP. There can be no assurance that such unrealized investments will be realized at the valuations shown. Actual realized returns will depend on, among other factors, future operating results, the value of the assets and market conditions at the time of disposition, if any, any related transaction costs and the timing and manner of sale, all of which may differ from the assumptions on which the valuations used in the performance data contained herein are based. Accordingly, the actual realized returns on these unrealized investments may differ materially from the estimated returns and/or valuations indicated herein. Unrealized value also referred to as NAV herein.
- **TOTAL VALUE** is equal to the Realized Value plus Unrealized Value.
- **GROSS MOIC** (Gross Multiple on Invested Capital) equals Total Value (Realized and Unrealized Value) divided by the Invested Capital.
- **GROSS IRR** represents the annual pre-tax internal rate of return based on the actual dates of the related cash flows and Unrealized Value as of the date referenced herein. Gross IRRs are calculated before reductions for management fees, placement fees, partnership expenses, and carried interest.

DEFINED TERMS AND ENDNOTES AS OF 9/30/21

PERFORMANCE / TRACK RECORD NOTES (CONTINUED)

- **NET MOIC** or Total Value to Paid-in Capital (TVPI) equals Total Value divided by total contributions (including management fees, placement fees, fund interest expense and partnership expenses). Net MOICs are calculated on a blended basis, net to LPs. Includes (i) formation expenses and start-up capital associated with inactive platform companies and (ii) ticking fee proceeds associated with assets transferred from REP II to EOF; these items are excluded from the Gross MOIC calculation.
- **NET IRRs** are calculated on a timeline (i.e., cash in/cash out) basis including Unrealized Value as of the date referenced herein and after deducting carried interest, management fees, placement fees, and partnership expenses. Net IRRs are calculated on a blended basis, net to LPs. Includes (i) formation expenses and start-up capital associated with inactive platform companies and (ii) ticking fee proceeds associated with assets transferred from REP II to EOF; these items are excluded from the Gross IRR calculation. Net IRRs reflect the reinvestment of proceeds where applicable. Ridgemont funds may have used a capital call line of credit pursuant to which such funds borrow on a short-term basis to fund investments and bridge capital calls. The use of a capital call line of credit delays the timing of investor capital contributions, although it also generates interest expense for the relevant fund and other costs associated with the line of credit that would not otherwise have been incurred. As a result, the Net IRR for such Ridgemont funds may be greater than it would have been without the use of such capital call line of credit.

San Joaquin County Employees' Retirement Association (SJCERA)

Preliminary Monthly Flash Report (Net)[1] — November 2021

	Commitment ($000)	Sub-Segment	Market Value	Physical % of Total	Policy Target %	1-Mo	3-Mos	YTD	1-Yr	3-Yrs	5-Yrs	SI Return	SI Date
TOTAL PLAN[1]			**$ 3,934,249,596**	**100.0%**	**100.0%**	**-1.2**	**-0.3**	**10.0**	**13.8**	**10.0**	**8.4**	**7.9**	**Apr-90**
Policy Benchmark[4]						*-0.6*	*0.4*	*9.7*	*11.6*	*10.5*	*9.3*	*7.8*	
Difference:						-0.6	-0.7	0.3	2.2	-0.5	-0.9	0.1	
75/25 Portfolio[5]						*-1.9*	*-1.7*	*9.4*	*13.7*	*14.6*	*11.8*	*7.7*	
Difference:						0.7	1.4	0.6	0.1	-4.6	-3.4	0.2	
Broad Growth			**$ 2,949,393,969**	**75.0%**	**75.0%**	**-1.4**	**-0.1**	**13.1**	**17.8**	**11.6**	**10.4**	**8.6**	**Jan-95**
Aggressive Growth Lag[2]			**$ 292,918,321**	**7.4%**	**10.0%**	**7.0**	**7.0**	**19.0**	**23.0**	**12.6**	**11.7**	**-4.2**	**Feb-05**
MSCI ACWI +2%Lag						*2.4*	*3.7*	*12.3*	*46.5*	*11.3*	*10.4*	*0.0*	
Difference:						4.6	3.3	6.7	-23.5	1.3	1.3	-4.2	
BlackRock Global Energy&Power Lag[3]	*$50,000*	*Global Infrastructure*	$ 19,405,556	0.5%		1.6	1.6	4.4	4.6	--	--	9.4	Jul-19
MSCI ACWI +2% Lag						*1.5*	*8.0*	*31.1*	*42.6*	--	--	*21.8*	
Difference:						0.1	-6.4	-26.7	-38.0	--	--	-12.4	
Ocean Avenue II Lag[3]	*$40,000*	*PE Buyout FOF*	$ 35,004,179	0.9%		10.7	10.7	67.0	99.9	30.5	28.6	16.5	May-13
MSCI ACWI +2% Lag						*1.5*	*8.0*	*31.1*	*42.6*	*16.4*	*13.4*	*11.6*	
Difference:						9.2	2.7	35.9	57.3	14.1	15.2	4.9	
Ocean Avenue III Lag[3]	*$50,000*	*PE Buyout FOF*	$ 44,100,795	1.1%		6.9	6.9	34.0	39.1	24.6	--	23.0	Apr-16
MSCI ACWI +2% Lag						*1.5*	*8.0*	*31.1*	*42.6*	*16.4*	--	*13.1*	
Difference:						5.4	-1.1	2.9	-3.5	8.2	--	9.9	
Ocean Avenue IV Lag[3]	*$50,000*	*PE Buyout*	$ 35,617,418	0.9%		8.8	8.8	37.2	48.7	--	--	35.6	Dec-19
MSCI ACWI +2% Lag						*1.5*	*8.0*	*31.1*	*42.6*	--	--	*25.6*	
Difference:						7.3	0.8	6.1	6.1	--	--	10.0	
Morgan Creek III Lag[3]	*$10,000*	*Multi-Strat FOF*	$ 7,596,284	0.2%		-0.8	-0.8	11.0	13.0	-5.6	2.5	-1.1	Feb-15
MSCI ACWI +2% Lag						*1.5*	*8.0*	*31.1*	*42.6*	*16.4*	*13.4*	*12.4*	
Difference:						-2.3	-8.8	-20.1	-29.6	-22.0	-10.9	-13.5	
Morgan Creek V Lag[3]	*$12,000*	*Multi-Strat FOF*	$ 8,733,588	0.2%		3.8	3.8	16.9	29.7	13.6	12.6	13.5	Jun-13
MSCI ACWI +2% Lag						*1.5*	*8.0*	*31.1*	*42.6*	*16.4*	*13.4*	*11.7*	
Difference:						2.3	-4.2	-14.2	-12.9	-2.8	-0.8	1.8	
Morgan Creek VI Lag[3]	*$20,000*	*Multi-Strat FOF*	$ 24,703,319	0.6%		12.3	12.3	33.6	43.6	21.4	18.1	10.2	Feb-15
MSCI ACWI +2% Lag						*1.5*	*8.0*	*31.1*	*42.6*	*16.4*	*13.4*	*12.4*	
Difference:						10.8	4.3	2.5	1.0	5.0	4.7	-2.2	
Stellex Capital Partners II Lag[3]	*$50,000*	*Multi-Strat FOF*	$ 4,906,200	0.1%		-11.3	--	--	--	--	--	-11.3	Jul-21
MSCI ACWI +2% Lag						*1.5*	--	--	--	--	--	*3.3*	
Difference:						-12.8	--	--	--	--	--	-14.6	
Opportunistic Private Real Estate													
Greenfield V[3]	*$30,000*	*Opportunistic Pvt. RE*	$ 227,258	0.0%		-0.7	-0.7	-0.8	-2.8	-11.7	-3.7	-3.1	Jul-08
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*8.5*	
Difference:						-3.6	-3.6	-5.8	-8.4	-19.8	-13.2	-11.6	
Greenfield VI[3]	*$20,000*	*Opportunistic Pvt. RE*	$ 171,705	0.0%		-38.1	-38.1	-38.4	-52.0	-43.6	-30.8	-3.1	Apr-12
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*12.7*	
Difference:						-41.0	-41.0	-43.4	-57.6	-51.7	-40.3	-15.8	
Greenfield VII[3]	*$19,100*	*Opportunistic Pvt. RE*	$ 9,301,411	0.2%		12.2	12.2	12.5	26.5	14.3	14.1	13.5	Oct-14
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*11.7*	
Difference:						9.3	9.3	7.5	20.9	6.2	4.6	1.8	
Grandview[3]	*$30,000*	*Opportunistic Pvt. RE*	$ 20,316,979	0.5%		13.2	13.2	19.6	42.3	27.1	--	11.2	Apr-18
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	--	*9.4*	
Difference:						10.3	10.3	14.6	36.7	19.0	--	1.8	
Miller Global Fund VI[3]	*$30,000*	*Opportunistic Pvt. RE*	$ 481,237	0.0%		19.0	19.0	45.9	206.5	-20.2	-8.9	-3.6	May-08
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*8.5*	
Difference:						16.1	16.1	40.9	200.9	-28.3	-18.4	-12.1	
Miller Global Fund VII[3]	*$15,000*	*Opportunistic Pvt. RE*	$ 273,467	0.0%		14.0	14.0	14.0	123.4	-2.4	2.0	25.2	Dec-12
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*12.1*	
Difference:						11.1	11.1	9.0	117.8	-10.5	-7.5	13.1	

[1] Returns are preliminary and are finalized during each quarterly reporting cycle. Monthly returns since previous quarter are provided by the managers. Market values are provided by Northern Trust.

[2] Total class returns are as of 9/30/21, and lagged 1 quarter.

[3] Manager returns are as of 9/30/21, and lagged 1 quarter. Since Inception date reflects one quarter lag.

[4] 4/1/20 to present benchmark is **32%** MSCI ACWI IMI, **10%** BB Aggregate Bond Index, **17%** *50%* BB High Yield/*50%* S&P Leveraged Loans, 6% NCREIF ODCE +1% lag; **10%** T-Bill +4%, **10%** MSCI ACWI +2%, **15%** CRO Custom Benchmark. Prior to 4/1/20 benchmark is legacy policy benchmark.

[5] 4/1/20 to present **75%** MSCI ACWI, **25%** BB Global Aggregate. Prior to 4/1/20 60% MSCI ACWI, 40% BB Global Aggregate.

San Joaquin County Employees' Retirement Association (SJCERA)

Preliminary Monthly Flash Report (Net)[1] — November 2021

	Commitment ($000)	Sub-Segment	Market Value	Physical % of Total	Policy Target %	1-Mo	3-Mos	YTD	1-Yr	3-Yrs	5-Yrs	SI Return	SI Date
Opportunistic Private Real Estate (continued)													
Walton Street V[3]	*$30,000*	*Opportunistic Pvt. RE*	$ 2,071,307	0.1%		0.5	0.5	1.4	-3.2	-13.8	-8.8	-4.2	Nov-06
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*7.3*	
Difference:						-2.4	-2.4	-3.6	-8.8	-21.9	-18.3	-11.5	
Walton Street VI[3]	*$15,000*	*Opportunistic Pvt. RE*	$ 4,919,114	0.1%		4.8	4.8	4.0	4.6	-1.7	-0.1	7.0	Jul-09
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*8.4*	
Difference:						1.9	1.9	-1.0	-1.0	-9.8	-9.6	-1.4	
Value-Added Private Real Estate													
AG Core Plus IV[3]	*$20,000*	*Value-Added Pvt. RE*	$ 19,298,414	0.5%		4.2	4.2	6.5	12.7	8.8	9.0	5.3	Sep-15
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*11.1*	
Difference:						1.3	1.3	1.5	7.1	0.7	-0.5	-5.8	
Almanac Realty VI[3]	*$30,000*	*Value-Added Pvt. RE*	$ 3,609,976	0.1%		8.8	8.8	9.9	3.4	-11.1	-4.6	22.4	Feb-13
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*12.7*	
Difference:						5.9	5.9	4.9	-2.2	-19.2	-14.1	9.7	
Berkeley Partners Fund V, LP	*$40,000*	*Value-Added Pvt. RE*	$ 9,285,074	0.2%		6.7	6.7	11.7	--	--	--	19.2	Aug-20
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	--	--	--	*10.0*	
Difference:						3.8	3.8	6.7	--	--	--	9.2	
Stockbridge RE III[3]	*$45,000*	*Value-Added Pvt. RE*	$ 35,179,678	0.9%		15.0	15.0	20.1	29.7	10.8	--	8.3	Jul-18
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	--	*9.0*	
Difference:						12.1	12.1	15.1	24.1	2.7	--	-0.7	
Traditional Growth[2]			**$ 1,478,938,014**	**37.6%**	**32.0%**	**-2.6**	**-1.8**	**15.6**	**21.4**	**13.3**	**12.2**	**9.6**	**Jan-95**
MSCI ACWI IMI Net						*-2.7*	*-2.0*	*13.7*	*19.4*	*16.7*	*14.7*	*8.3*	
Difference:						0.1	0.2	1.9	2.0	-3.4	-2.5	1.3	
Global Equity			$ 1,428,598,805	36.3%									
Northern Trust MSCI World IMI		*All Cap Global*	$ 1,289,895,092	32.8%		-2.4	-1.2	16.6	22.1	--	--	23.4	Sep-20
MSCI World IMI Net						*-2.5*	*-1.4*	*16.2*	*21.5*	--	--	*22.8*	
Difference:						0.1	0.2	0.4	0.6	--	--	0.6	
SJCERA Transition		*All Cap Global*	$ 3,229	0.0%		NM	NM	NM	NM	--	--	NM	Jul-20
Emerging Markets			$ 138,700,484										
GQG Active Emerging Markets		*Emerging Markets*	$ 63,820,422	1.6%		-3.7	-5.7	-3.3	3.4	--	--	10.8	Aug-20
MSCI Emerging Markets Index Net						*-4.1*	*-7.0*	*-4.3*	*2.7*	--	--	*11.2*	
Difference:						0.4	1.3	1.0	0.7	--	--	-0.4	
PIMCO RAE Fundamental Emerging Markets		*Emerging Markets*	$ 74,880,062	1.9%		-4.6	-8.2	10.3	21.4	7.5	7.8	5.1	Apr-07
MSCI Emerging Markets Index						*-4.1*	*-6.9*	*-4.1*	*3.0*	*9.7*	*9.9*	*4.6*	
Difference:						-0.5	-1.3	14.4	18.4	-2.2	-2.1	0.5	
REITS			$ 50,339,209	1.3%									
Invesco All Equity REIT		*Core US REIT*	$ 50,339,209	1.3%		-1.0	-0.2	29.1	31.3	11.3	10.0	9.5	Aug-04
FTSE NAREIT Equity Index						*-0.7*	*1.1*	*31.6*	*35.9*	*11.9*	*9.9*	*9.4*	
Difference:						-0.3	-1.3	-2.5	-4.6	-0.6	0.1	0.1	

[1] Returns are preliminary and are finalized during each quarterly reporting cycle. Monthly returns since previous quarter are provided by the managers. Market values are provided by Northern Trust.

[2] MSCI ACWI IMI Net as of 4/1/2020, MSCI ACWI Gross prior.

[3] Manager returns are as of 9/30/21, and lagged 1 quarter. Since Inception date reflects one quarter lag.

NM = Returns not meaningful

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	Commitment ($000)	Sub-Segment	Market Value	Physical % of Total	Policy Target %	1-Mo	3-Mos	YTD	1-Yr	3-Yrs	5-Yrs	SI Return	SI Date
Stabilized Growth			**$ 1,177,537,634**	**29.9%**	**33.0%**	**-0.2**	**0.1**	**6.5**	**9.1**	**8.9**	**7.4**	**4.1**	**Jan-05**
Risk Parity			$ 441,825,500	11.2%		0.2	-1.7	8.0	11.8	12.4	9.1	5.3	
T-Bill +4%						*0.3*	*1.0*	*3.7*	*4.1*	*5.1*	*5.2*	*4.5*	
Difference:						-0.1	-2.7	4.3	7.7	7.3	3.9	0.8	
Bridgewater All Weather		*Risk Parity*	$ 217,335,144	5.5%		0.5	-1.0	9.1	13.0	11.1	8.5	5.9	Mar-12
T-Bill +4%						*0.3*	*1.0*	*3.7*	*4.1*	*5.1*	*5.2*	*5.5*	
Difference:						0.2	-2.0	5.4	8.9	6.0	3.3	0.4	
PanAgora Diversified Risk Multi-Asset		*Risk Parity*	$ 224,490,356	5.7%		-0.1	-2.4	6.9	10.6	13.6	9.8	8.9	Apr-16
T-Bill +4%						*0.3*	*1.0*	*3.7*	*4.1*	*5.1*	*5.2*	*5.1*	
Difference:						-0.4	-3.4	3.2	6.5	8.5	4.6	3.8	
Liquid Credit			$ 234,678,243	6.0%		-1.1	-1.2	1.4	2.8	4.2	3.8	2.2	Oct-06
50% BB High Yield, 50% S&P/LSTA Leveraged Loans						*-0.6*	*-0.2*	*3.9*	*5.6*	*5.9*	*5.3*	*5.9*	
Difference:						-0.5	-1.0	-2.5	-2.8	-1.7	-1.5	-3.7	
Neuberger Berman		*Global Credit*	$ 105,201,115	2.7%		-1.1	-1.7	1.1	2.8	--	--	5.0	Feb-19
33% ICE BofA HY Constrained, 33% S&P/LSTA LL, 33% JPM EMBI Glbl Div.						*-1.0*	*-1.4*	*1.6*	*3.3*	--	--	*5.2*	
Difference:						-0.1	-0.3	-0.5	-0.5	--	--	-0.2	
Stone Harbor Absolute Return		*Absolute Return*	$ 129,477,128	3.3%		-1.1	-0.7	1.5	2.8	3.8	3.3	2.9	Oct-06
3-Month Libor Total Return						*0.0*	*0.0*	*0.2*	*0.2*	*1.4*	*1.4*	*1.4*	
Difference:						-1.1	-0.7	1.3	2.6	2.4	1.9	1.5	
Private Credit Lag[2]			$ 326,931,142	8.3%		2.8	2.8	4.6	5.9	3.2	3.2	3.4	
50% BB High Yield, 50% S&P/LSTA Leveraged Loans						*0.1*	*1.3*	*6.5*	*22.2*	*5.5*	*6.7*	*6.0*	
Difference:						2.7	1.5	-1.9	-16.3	-2.3	-3.5	-2.6	
BlackRock Direct Lending Lag[3]	*$100,000*	*Direct Lending*	$ 40,994,496	1.0%		0.9	0.9	0.9	10.4	--	--	9.6	May-20
CPI +6% Annual Blend [5]						*1.4*	*4.1*	*4.1*	*14.6*	--	--	*17.6*	
Difference:						-0.5	-3.2	-3.2	-4.2	--	--	-8.0	
Mesa West RE Income III Lag[3]	*$45,000*	*Comm. Mortgage*	$ 36,476	0.0%		3.7	3.7	-7.8	-8.2	-0.7	3.4	3.4	Sep-13
CPI +6% Annual Blend [4]						*1.4*	*4.1*	*9.0*	*11.7*	*8.7*	*8.9*	*11.4*	
Difference:						2.3	-0.4	-16.8	-19.9	-9.4	-5.5	-8.0	
Mesa West RE Income IV Lag[3]	*$75,000*	*Comm. Mortgage*	$ 29,344,469	0.7%		1.9	1.9	5.1	6.6	7.6	--	7.4	Mar-17
CPI +6% Annual Blend [4]						*1.4*	*4.1*	*9.0*	*11.7*	*8.7*	--	*8.9*	
Difference:						0.5	-2.2	-3.9	-5.1	-1.1	--	-1.5	
Crestline Opportunity II Lag[3]	*$45,000*	*Opportunistic*	$ 20,377,954	0.5%		5.1	5.1	13.6	15.5	1.0	4.4	5.3	Nov-13
CPI +6% Annual Blend [4]						*1.4*	*4.1*	*9.0*	*11.7*	*8.7*	*8.9*	*8.9*	
Difference:						3.7	1.0	4.6	3.8	-7.7	-4.5	-3.6	
Davidson Kempner Distr Opp V Lag[3]	*$50,000*	*Opportunistic*	$ 30,331,521	0.0%		5.4	5.4	23.5	49.5	--	--	49.5	Oct-20
CPI +6% Annual Blend [4]						*1.4*	*4.1*	*9.0*	*11.7*	--	--	*11.7*	
Difference:						4.0	1.3	14.5	37.8	--	--	37.8	
Oaktree Lag	*$50,000*	*Leveraged Direct*	$ 31,028,345	0.8%		2.9	2.9	11.8	18.4	14.3	--	10.6	Mar-18
CPI +6% Annual Blend [6]						*1.4*	*4.1*	*9.0*	*18.6*	*10.4*	--	*9.1*	
Difference:						1.5	-1.2	2.8	-0.2	3.9	--	1.5	
HPS EU Asset Value II Lag[3]	*$50,000*	*Direct Lending*	$ 20,040,468	0.5%		1.3	1.3	6.3	14.7	--	--	-0.9	Aug-20
CPI +6% Annual Blend [4]						*1.4*	*4.1*	*9.0*	*11.7*	--	--	*11.4*	
Difference:						-0.1	-2.8	-2.7	3.0	--	--	-12.3	
Raven Opportunity II Lag[3]	*$45,000*	*Direct Lending*	$ 9,331,766	0.2%		-4.5	-4.5	-3.6	-2.5	-5.4	-4.3	-4.8	Aug-14
CPI +6% Annual Blend [4]						*1.4*	*4.1*	*9.0*	*11.7*	*8.7*	*8.9*	*8.9*	
Difference:						-5.9	-8.6	-12.6	-14.2	-14.1	-13.2	-13.7	
Raven Opportunity III Lag[3]	*$50,000*	*Direct Lending*	$ 48,132,680	1.2%		1.8	1.8	6.5	10.1	6.9	10.1	2.6	Nov-15
CPI +6% Annual Blend [4]						*1.4*	*4.1*	*9.0*	*11.7*	*8.7*	*8.9*	*8.9*	
Difference:						0.4	-2.3	-2.5	-1.6	-1.8	1.2	-6.3	

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[2] Total class returns are as of 9/30/21, and lagged 1 quarter.

[3] Manager returns are as of 9/30/21, and lagged 1 quarter. Since Inception date reflects one quarter lag.

[4] 9% Annual until 7/1/2018 then CPI +6% Annual thereafter.

[5] 50% Bloomberg High Yield/50% S&P Leveraged Loan until 12/31/20 then CPI +6% Annual thereafter. Benchmark lagged one quarter.

[6] MSCI ACWI + 2% until 12/31/20 then CPI +6% Annual thereafter. Benchmark lagged one quarter

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	Commitment ($000)	Sub-Segment	Market Value	Physical % of Total	Policy Target %	1-Mo	3-Mos	YTD	1-Yr	3-Yrs	5-Yrs	SI Return	SI Date
Private Credit Lag (continued)													
Medley Opportunity II Lag[3]	*$50,000*	*Direct Lending*	$ 10,229,923	0.3%		0.1	0.1	11.8	0.8	-10.5	-6.5	-1.0	Jul-12
CPI +6% Annual Blend[4]						*1.4*	*4.1*	*9.0*	*11.7*	*8.7*	*8.9*	*8.9*	
Difference:						-1.3	-4.0	2.8	-10.9	-19.2	-15.4	-9.9	
White Oak Summit Peer Fund Lag[3]	*$50,000*	*Direct Lending*	$ 38,581,110	1.0%		0.7	0.7	4.1	5.9	5.8	6.9	6.9	Mar-16
CPI +6% Annual Blend[4]						*1.4*	*4.1*	*9.0*	*11.7*	*8.7*	*8.9*	*8.9*	
Difference:						-0.7	-3.4	-4.9	-5.8	-2.9	-2.0	-2.0	
White Oak Yield Spectrum Master V Lag[3]	*$50,000*	*Direct Lending*	$ 48,501,934	1.2%		0.5	0.5	1.3	3.3	--	--	-0.3	Mar-20
CPI +6% Annual Blend[4]						*1.4*	*4.1*	*9.0*	*11.7*	--	--	*9.7*	
Difference:						-0.9	-3.6	-7.7	-8.4	--	--	-10.0	
Principal US[3]	*$25,000*	*Core Pvt. RE*	$ 35,153,936	0.9%		3.7	3.7	6.2	8.0	5.5	6.7	7.5	Jan-16
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*10.4*	
Difference:						0.8	0.8	1.2	2.4	-2.6	-2.8	-2.9	
Prologis Logistics[3]	*$35,000*	*Core Pvt. RE*	$ 82,714,166	2.1%		3.4	3.4	9.0	20.6	14.4	16.3	7.0	Dec-07
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*8.8*	
Difference:						0.5	0.5	4.0	15.0	6.3	6.8	-1.8	
RREEF America II[3]	*$45,000*	*Core Pvt. RE*	$ 51,087,248	1.3%		3.7	3.7	5.7	6.5	5.6	6.5	7.0	Jul-16
NCREIF ODCE + 1% Lag Blend						*2.9*	*2.9*	*5.0*	*5.6*	*8.1*	*9.5*	*10.0*	
Difference:						0.8	0.8	0.7	0.9	-2.5	-3.0	-3.0	
Diversifying Strategies			**$ 790,076,658**	**20.1%**	**25.0%**	**-0.6**	**-1.1**	**0.4**	**1.8**	**4.2**	**2.7**	**6.3**	**Oct-90**
Principal Protection			**$ 330,517,394**	**8.4%**	**10.0%**	**0.0**	**-0.8**	**0.1**	**1.2**	**3.9**	**3.5**	**6.3**	Oct-90
BB Aggregate Bond Index						*0.3*	*-0.6*	*-1.3*	*-1.2*	*5.5*	*3.7*	*5.9*	
Difference:						-0.3	-0.2	1.4	2.4	-1.6	-0.2	0.4	
Dodge & Cox		*Core Fixed Income*	$ 216,297,989	5.5%		-0.2	-1.2	-1.0	-0.4	6.4	4.7	7.1	Oct-90
BB Aggregate Bond Index						*0.3*	*-0.6*	*-1.3*	*-1.2*	*5.5*	*3.7*	*5.9*	
Difference:						-0.5	-0.6	0.3	0.8	0.9	1.0	1.2	
DoubleLine Capital		*MBS*	$ 114,219,405	2.9%		0.4	0.2	2.3	2.7	4.5	3.8	4.9	Feb-12
BB Aggregate Bond Index						*0.3*	*-0.6*	*-1.3*	*-1.2*	*5.5*	*3.7*	*2.9*	
Difference:						0.1	0.8	3.6	3.9	-1.0	0.1	2.0	

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[4] 9% Annual until 7/1/2018 then CPI +6% Annual thereafter.

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	Commitment ($000)	Sub-Segment	Market Value	Physical % of Total	Policy Target %	1-Mo	3-Mos	YTD	1-Yr	3-Yrs	5-Yrs	SI Return	SI Date
Crisis Risk Offset			**$ 459,559,264**	**11.7%**	**15.0%**	**-1.0**	**-1.3**	**0.6**	**2.3**	**4.1**	**2.2**	**6.3**	**Jan-05**
CRO Custom Benchmark [2]						*0.3*	*1.5*	*3.6*	*4.8*	*8.0*	*5.1*	*5.5*	
Difference:						-1.3	-2.8	-3.0	-2.5	-3.9	-2.9	0.8	
Long Duration			$ 157,835,360	4.0%		2.5	1.0	-3.2	-4.4	10.4	6.2	4.2	
BB US Long Duration Treasuries						*2.7*	*1.6*	*-3.3*	*-4.4*	*11.3*	*6.7*	*5.2*	
Difference:						-0.2	-0.6	0.1	0.0	-0.9	-0.5	-1.0	
Dodge & Cox Long Duration		*Long Duration*	$ 157,835,360	4.0%		2.5	1.0	-3.2	-4.4	10.4	6.2	4.2	Feb-16
BB US Long Duration Treasuries						*2.7*	*1.6*	*-3.3*	*-4.4*	*11.3*	*6.7*	*5.2*	
Difference:						-0.2	-0.6	0.1	0.0	-0.9	-0.5	-1.0	
Systematic Trend Following			$ 181,033,825	4.6%		-5.7	-2.7	6.0	15.7	4.5	0.9	8.0	
BTOP50 Index						*-2.1*	*1.6*	*9.3*	*13.9*	*7.2*	*3.1*	*4.6*	
Difference:						-3.6	-4.3	-3.3	1.8	-2.7	-2.2	3.4	
Mt. Lucas Managed Futures - Cash		*Systematic Trend Following*	$ 93,532,520	2.4%		-7.1	-1.4	11.0	24.4	3.8	-0.1	7.5	Jan-05
BTOP50 Index						*-2.1*	*1.6*	*9.3*	*13.9*	*7.2*	*3.1*	*4.6*	
Difference:						-5.0	-3.0	1.7	10.5	-3.4	-3.2	2.9	
Graham Tactical Trend		*Systematic Trend Following*	$ 87,501,305	2.2%		-4.2	-4.0	1.1	7.7	5.0	1.7	0.2	Apr-16
SG Trend Index						*-4.7*	*0.1*	*8.6*	*15.7*	*8.4*	*3.8*	*1.5*	
Difference:						0.5	-4.1	-7.5	-8.0	-3.4	-2.1	-1.3	
Alternative Risk Premia			$ 120,690,079	3.1%		2.1	-2.1	-1.9	-5.6	-4.0	-1.7	6.7	
5% Annual						*0.4*	*1.2*	*4.6*	*5.0*	*5.0*	*5.0*	*6.3*	
Difference:						1.7	-3.3	-6.5	-10.6	-9.0	-6.7	0.4	
AQR Style Premia		*Alternative Risk Premia*	$ 26,949,006	0.7%		1.2	-8.2	10.6	13.3	-10.4	-6.8	-5.9	May-16
5% Annual						*0.4*	*1.2*	*4.6*	*5.0*	*5.0*	*5.0*	*5.0*	
Difference:						0.8	-9.4	6.0	8.3	-15.4	-11.8	-10.9	
PE Diversified Global Macro		*Alternative Risk Premia*	$ 35,613,429	0.9%		4.3	7.1	-4.5	-13.5	-7.2	-4.2	-2.7	Jun-16
5% Annual						*0.4*	*1.2*	*4.6*	*5.0*	*5.0*	*5.0*	*5.0*	
Difference:						3.9	5.9	-9.1	-18.5	-12.2	-9.2	-7.7	
Lombard Odier		*Alternative Risk Premia*	$ 58,127,644	1.5%		1.1	-4.3	-5.4	-7.6	--	--	-4.3	Jan-19
5% Annual						*0.4*	*1.2*	*4.6*	*5.0*	--	--	*5.0*	
Difference:						0.7	-5.5	-10.0	-12.6	--	--	-9.3	
Cash[3]			**$ 144,111,249**	**3.7%**	**0.0%**	**0.0**	**0.0**	**0.1**	**0.1**	**0.8**	**0.9**	**2.4**	**Sep-94**
US T-Bills						*0.0*	*0.0*	*0.0*	*0.1*	*1.1*	*1.1*	*2.3*	
Difference:						0.0	0.0	0.1	0.0	-0.3	-0.2	0.1	
Northern Trust STIF		*Collective Govt. Short Term*	$ 163,613,202	4.2%		0.0	0.0	0.1	0.1	0.8	0.9	2.6	Jan-95
US T-Bills						0.0	0.0	0.0	0.1	1.1	1.1	*2.3*	
Difference:						0.0	0.0	0.1	0.0	-0.3	-0.2	0.3	
Parametric Overlay[4]		*Cash Overlay*	**$ 50,667,720**	**1.3%**		**0.0**	**0.0**	**0.0**	**0.0**	**--**	**--**	**0.0**	**Jan-20**

[1] Returns are preliminary and are finalized during each quarterly reporting cycle. Monthly returns since previous quarter are provided by the managers. Market values are provided by Northern Trust.

[2] Benchmark is (1/3) BB Long Duration Treasuries, (1/3) BTOP50 Index, (1/3) 5% Annual.

[3] Includes lagged cash.

[4] Given daily cash movement returns may vary from those shown above.

Capital Markets Outlook & Risk Metrics

As of December 31, 2021

Capital Markets Outlook

Markets

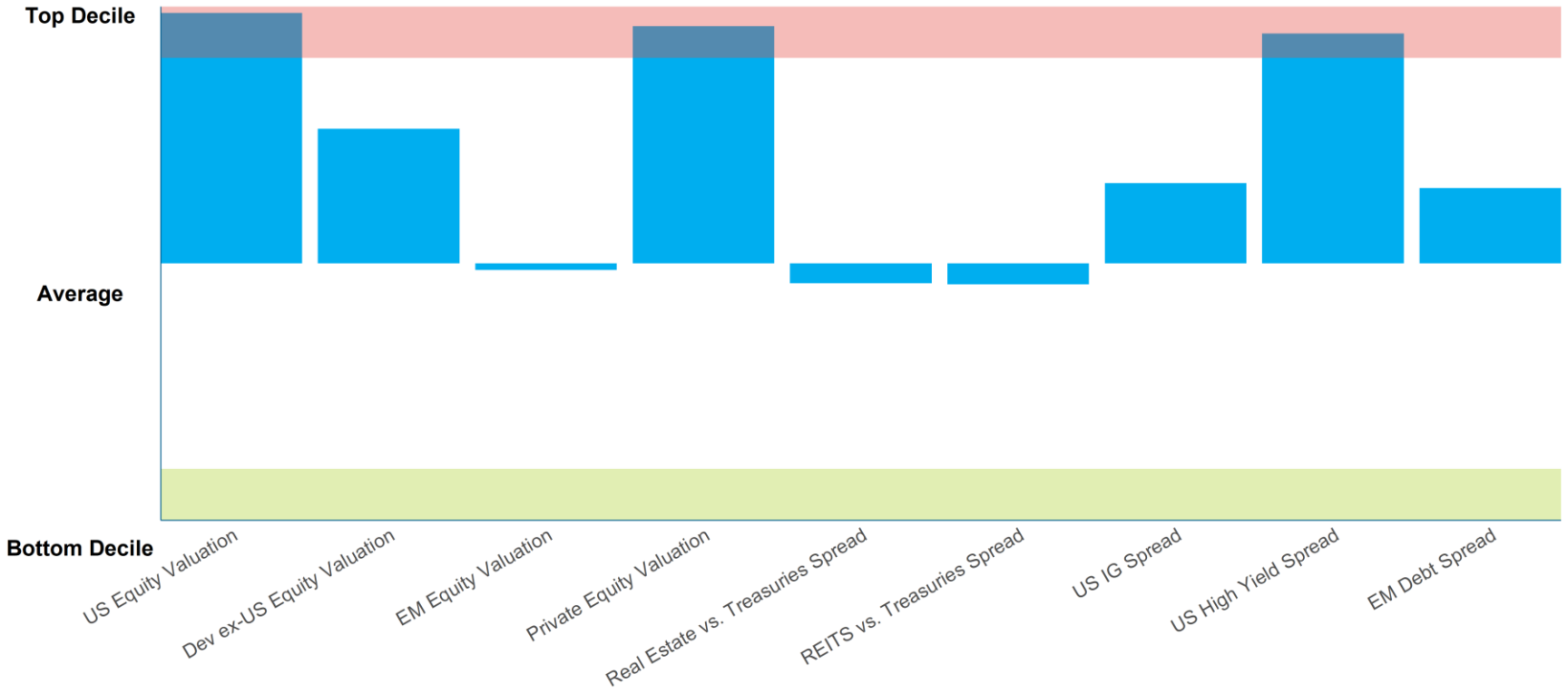
- Global markets generally posted positive returns in December, shaking-off Omicron variant and inflation concerns. In the US, the Fed indicated that tightening of policy may be brought forward with a more rapid reduction in asset purchases in 2022.
- China's equity market bucked the trend, posting negative returns due primarily to concerns about an economic slowdown linked to the real estate sector.
- In the US, large cap stocks outperformed midcap and small cap stocks, and value stocks beat growth stocks. While large cap value and growth stocks performed similarly in 2021, smaller cap value substantially outperformed small growth stocks for the year.
- Non-US developed markets rallied in December, with the EAFE modestly outperforming the S&P 500.
- In spite of negative returns in China, the broad emerging markets index posted gains. EM value stocks outperformed growth stocks in December and for the calendar year.
- The investment grade bond market produced negative returns in December, as inflation continued to weigh on nominal bond returns. However, TIPS and high yield bonds delivered positive returns.
- REITs and infrastructure stocks delivered very strong returns in December.
- After a difficult November, commodities returned to positive territory, offering support for natural resource stocks which posted strong returns.

Capital Markets Outlook

Markets

- US headline inflation climbed to a near 40-year high in November, as consumer prices rose 6.8% year-on-year, largely driven by higher energy costs, which rose 33%. Still, core inflation (ex-food and energy) rose 4.9% year-on-year.
- In China, Evergrande officially defaulted on $300 billion in debt and its shares were suspended from trading in Hong Kong. Policy makers cut borrowing costs and urged local governments and state-owned companies to finish real estate projects started by Evergrande. Concerns regarding other real estate developers continue to mount as the government steps in to support growth.
- While COVID continues to spread in developed and emerging markets, the Omicron variant has thus far proved to be less severe than the Delta variant, giving investors hope that recent travel bans and lockdowns might soon be rolled back.

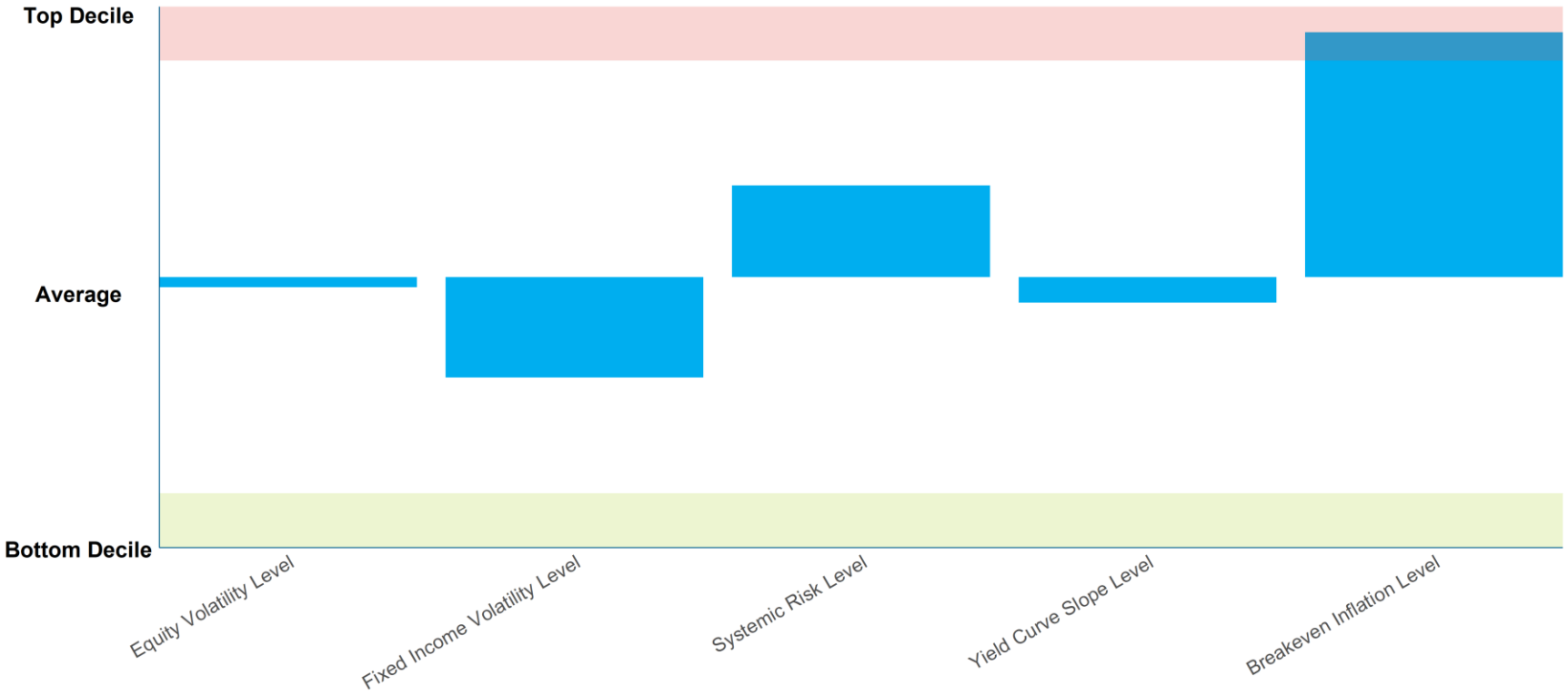
Risk Overview/Dashboard (1)
(As of December 31, 2021)[1]



- Dashboard (1) summarizes the current state of the different valuation metrics per asset class relative to their own history.

[1] With the exception of Private Equity Valuation, that is YTD as of December 31, 2020.

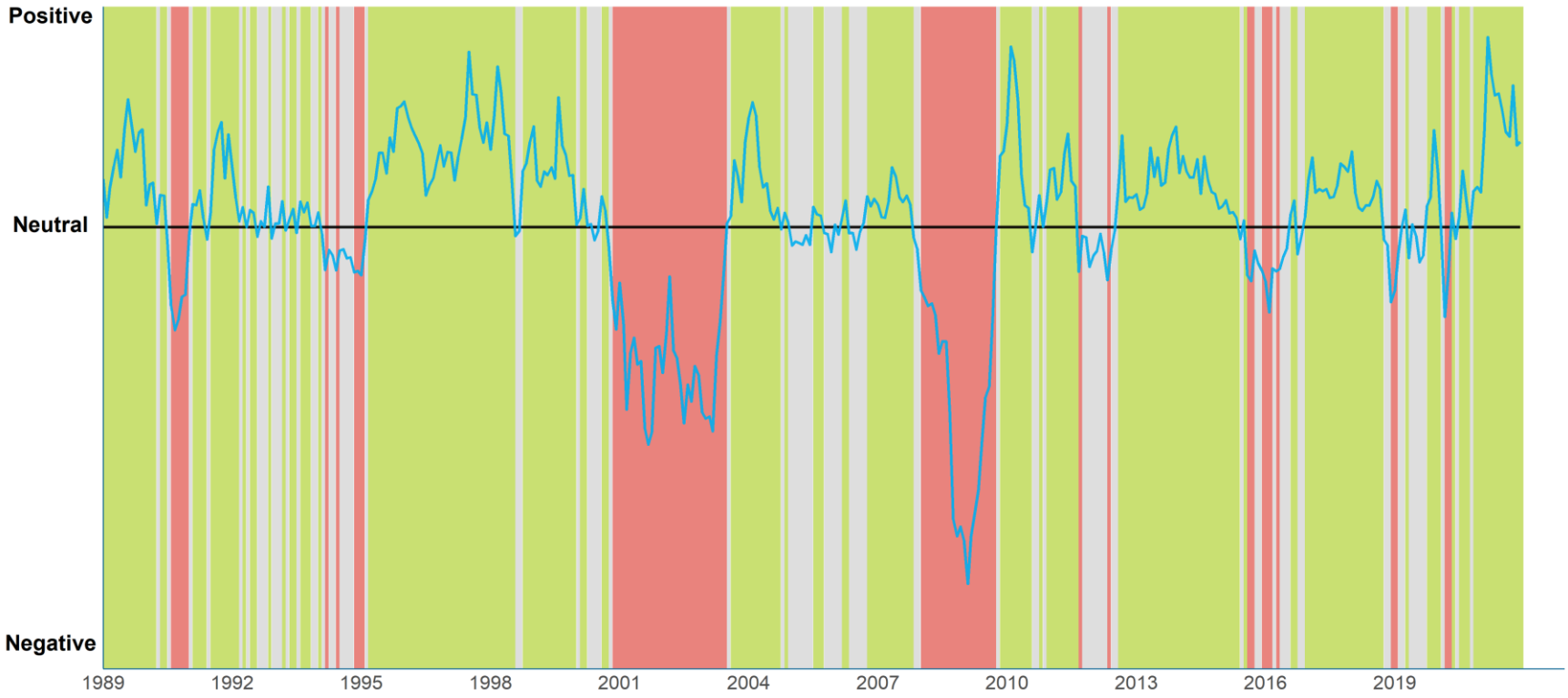
Risk Overview/Dashboard (2)
(As of December 31, 2021)



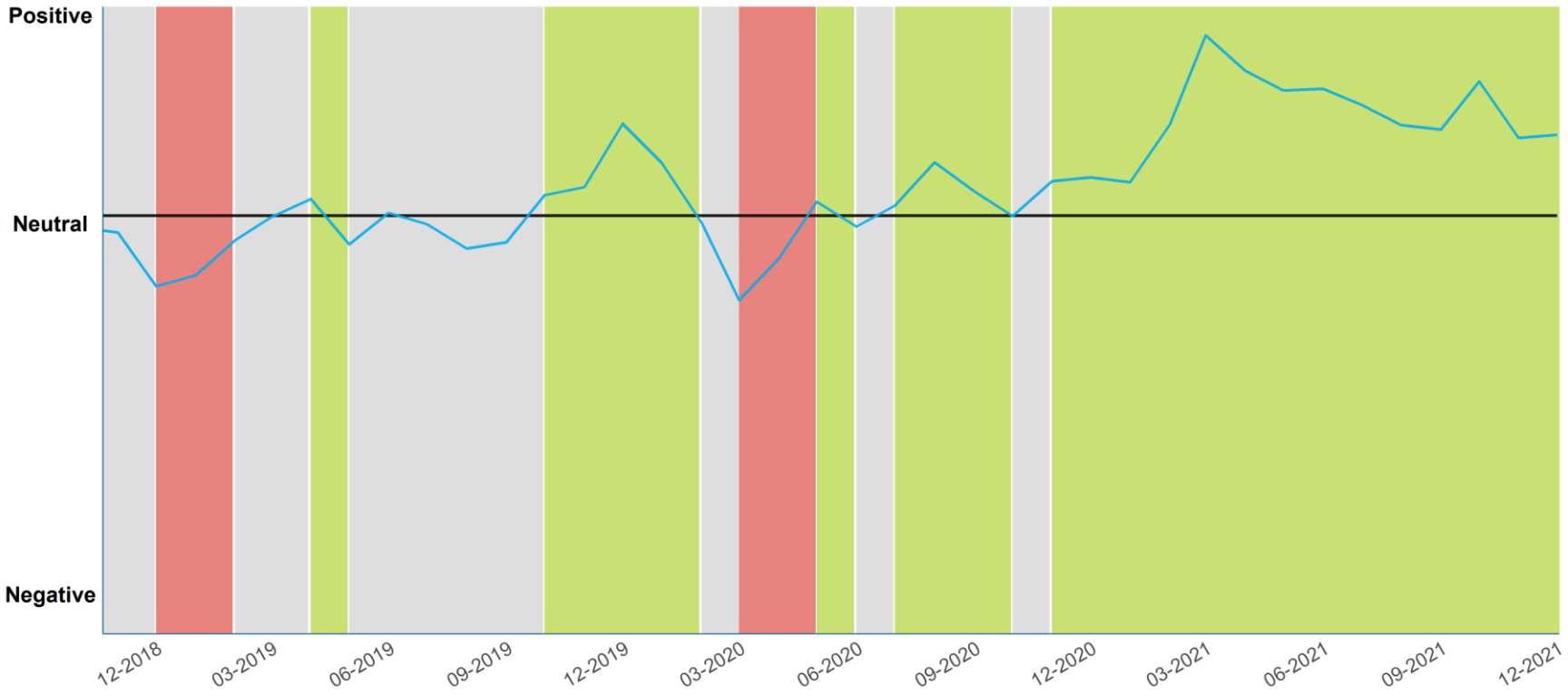
- Dashboard (2) shows how the current level of each indicator compares to its respective history.

Market Sentiment Indicator (All History)

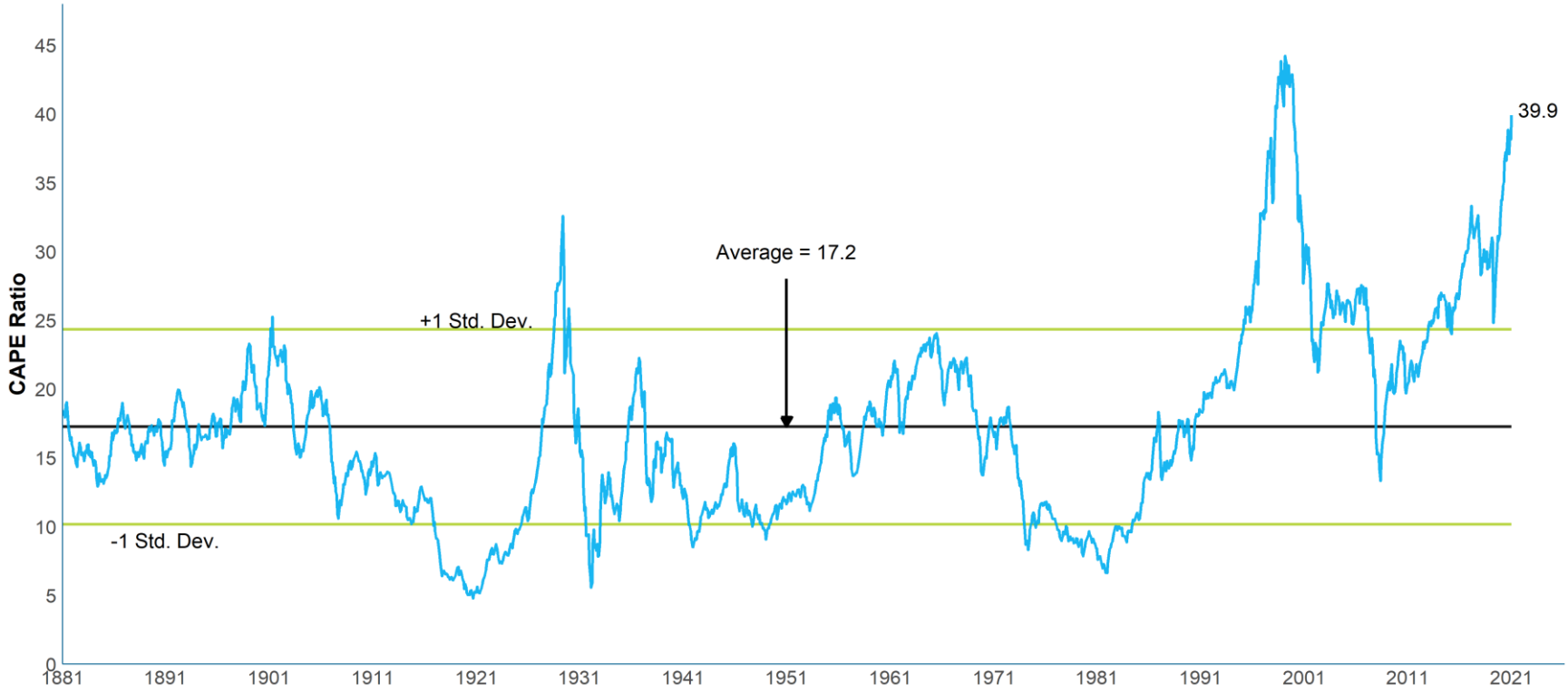
(As of December 31, 2021)



Market Sentiment Indicator (Last Three Years)
(As of December 31, 2021)



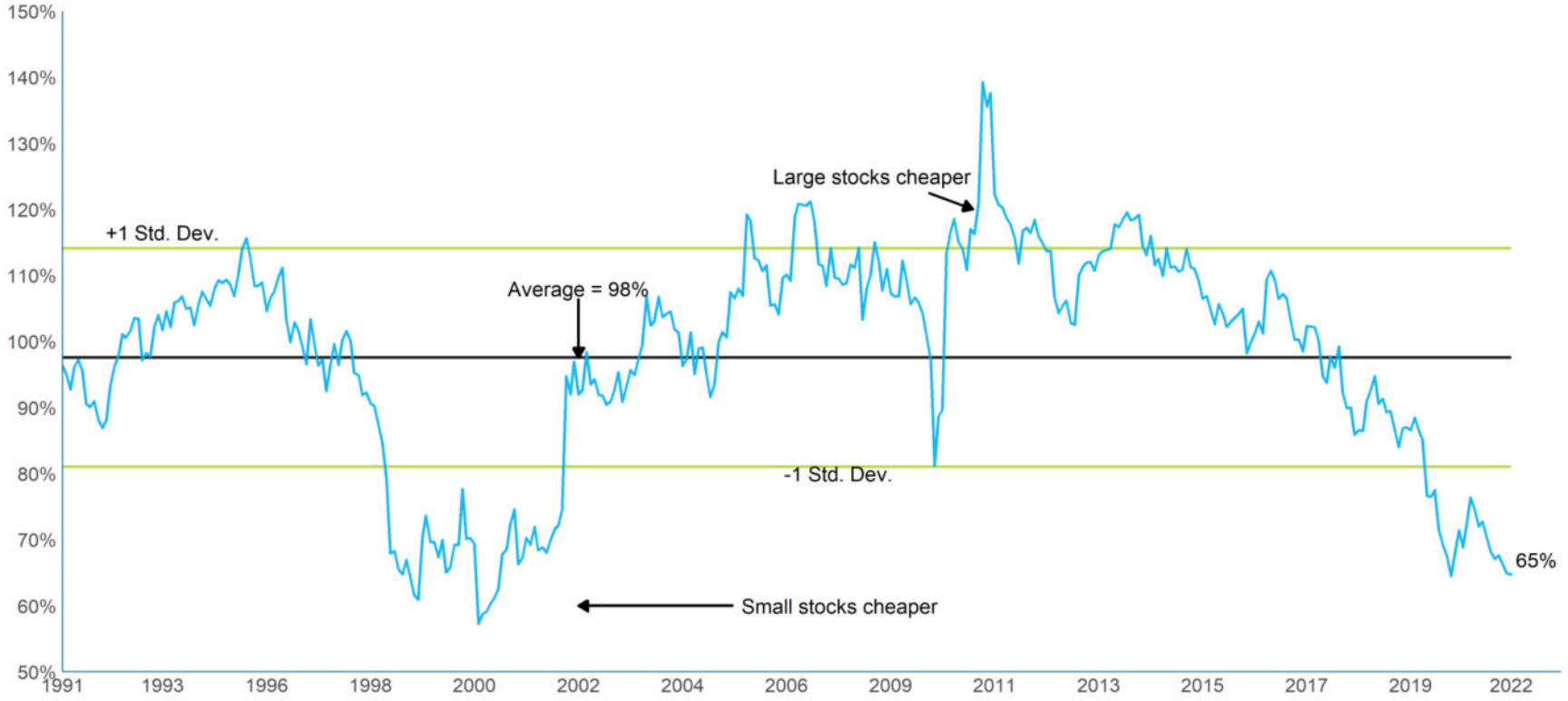
US Equity Cyclically Adjusted P/E[1]
(As of December 31, 2021)



- This chart details one valuation metric for US equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

[1] US Equity Cyclically Adjusted P/E on S&P 500 Index. Source: Robert Shiller, Yale University, and Meketa Investment Group.

Small Cap P/E vs. Large Cap P/E[1]
(As of December 31, 2021)



- This chart compares the relative attractiveness of small cap US equities vs. large cap US equities on a valuation basis. A higher (lower) figure indicates that large cap (small cap) is more attractive.

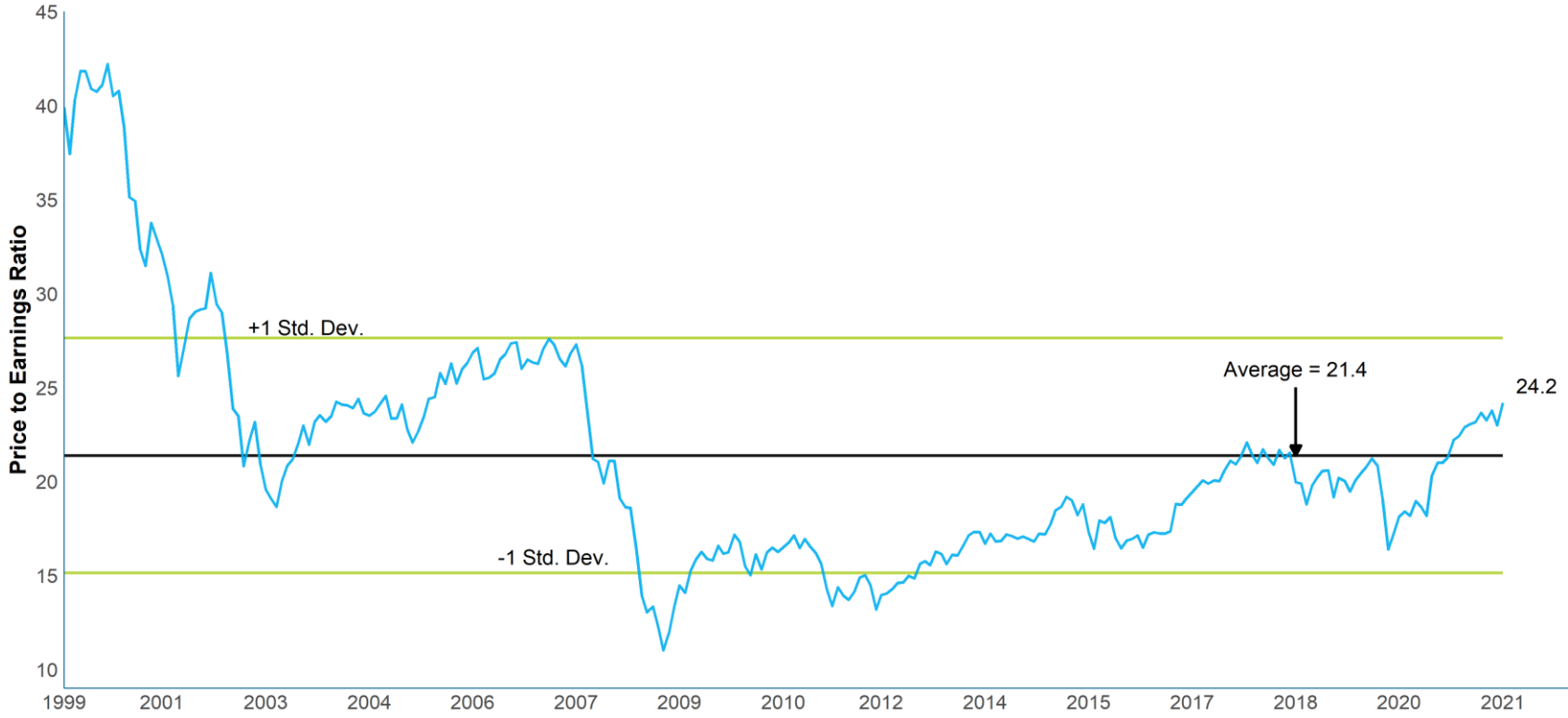
[1] Small Cap P/E (Russell 2000 Index) vs. Large Cap P/E (Russell 1000 Index) - Source: Russell Investments. Earnings figures represent 12-month "as reported" earnings.

Growth P/E vs. Value P/E[1]
(As of December 31, 2021)

- This chart compares the relative attractiveness of US growth equities vs. US value equities on a valuation basis. A higher (lower) figure indicates that value (growth) is more attractive.

[1] Growth P/E (Russell 3000 Growth Index) vs. Value (Russell 3000 Value Index) P/E - Source: Bloomberg, MSCI, and Meketa Investment Group. Earnings figures represent 12-month "as reported" earnings.

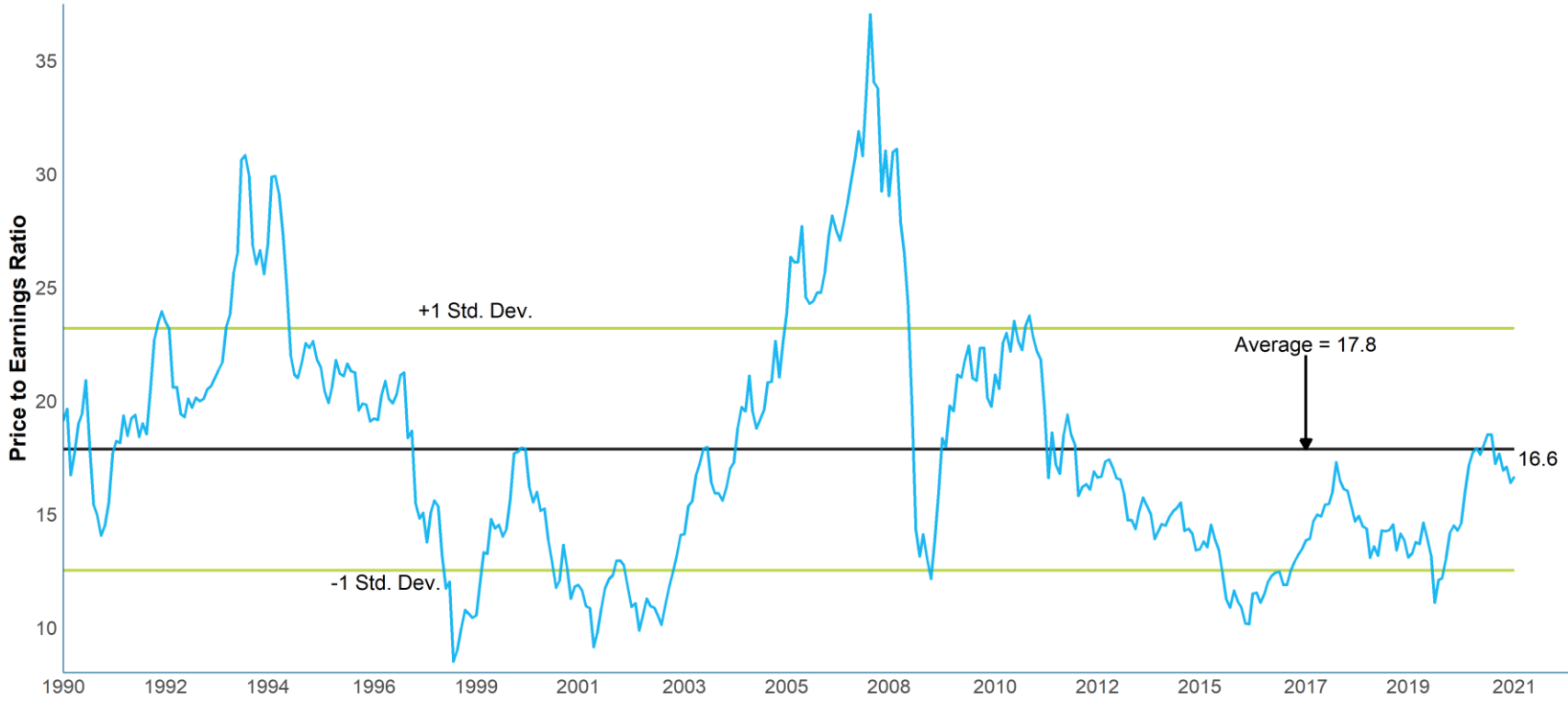
Developed International Equity Cyclically Adjusted P/E[1]
(As of December 31, 2021)



- This chart details one valuation metric for developed international equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

[1] Developed International Equity (MSCI EAFE Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years.

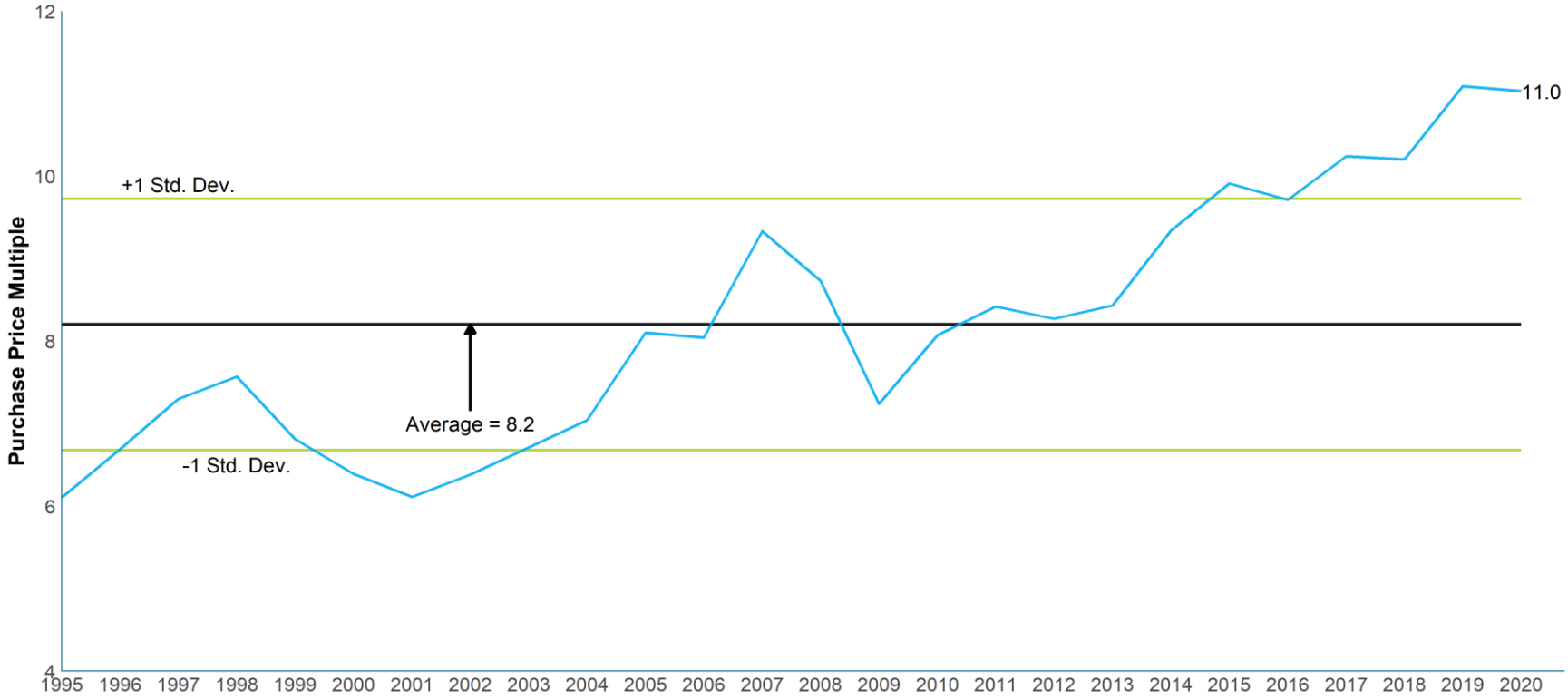
Emerging Market Equity Cyclically Adjusted P/E[1]
(As of December 31, 2021)



- This chart details one valuation metric for emerging markets equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

[1] Emerging Market Equity (MSCI Emerging Markets Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years.

Private Equity Multiples[1]
(As of February 28, 2021)[2]

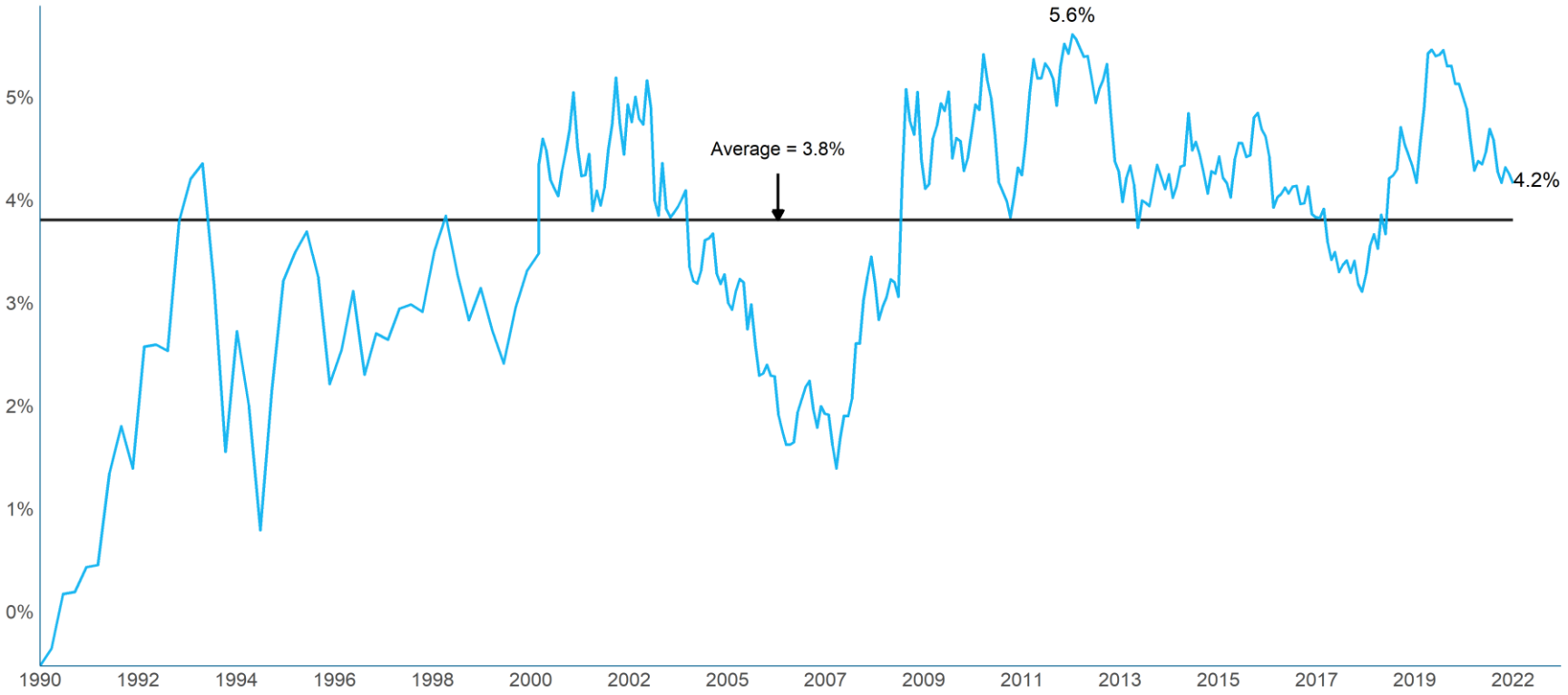


- This chart details one valuation metric for the private equity market. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

[1] Private Equity Multiples – Source: S&P LCD Average EBITDA Multiples Paid in All LBOs.

[2] Annual Data, as of December 31, 2020

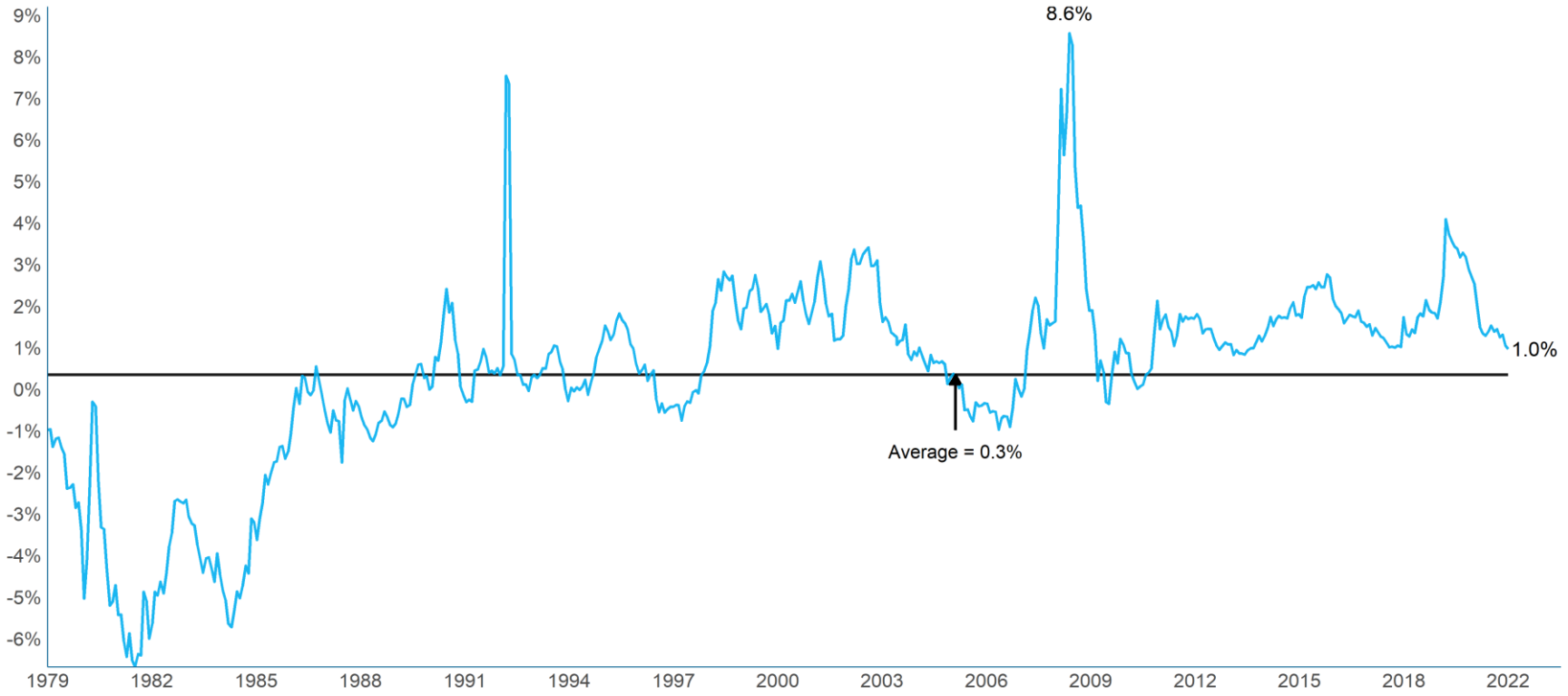
Core Real Estate Spread vs. Ten-Year Treasury[1]
(As of December 31, 2021)



- This chart details one valuation metric for the private core real estate market. A higher (lower) figure indicates cheaper (more expensive) valuation.

[1] Core Real Estate Spread vs. Ten-Year Treasury – Source: Real Capital Analytics, US Treasury, Bloomberg, and Meketa Investment Group. Core Real Estate is proxied by weighted sector transaction-based indices from Real Capital Analytics and Meketa Investment Group.

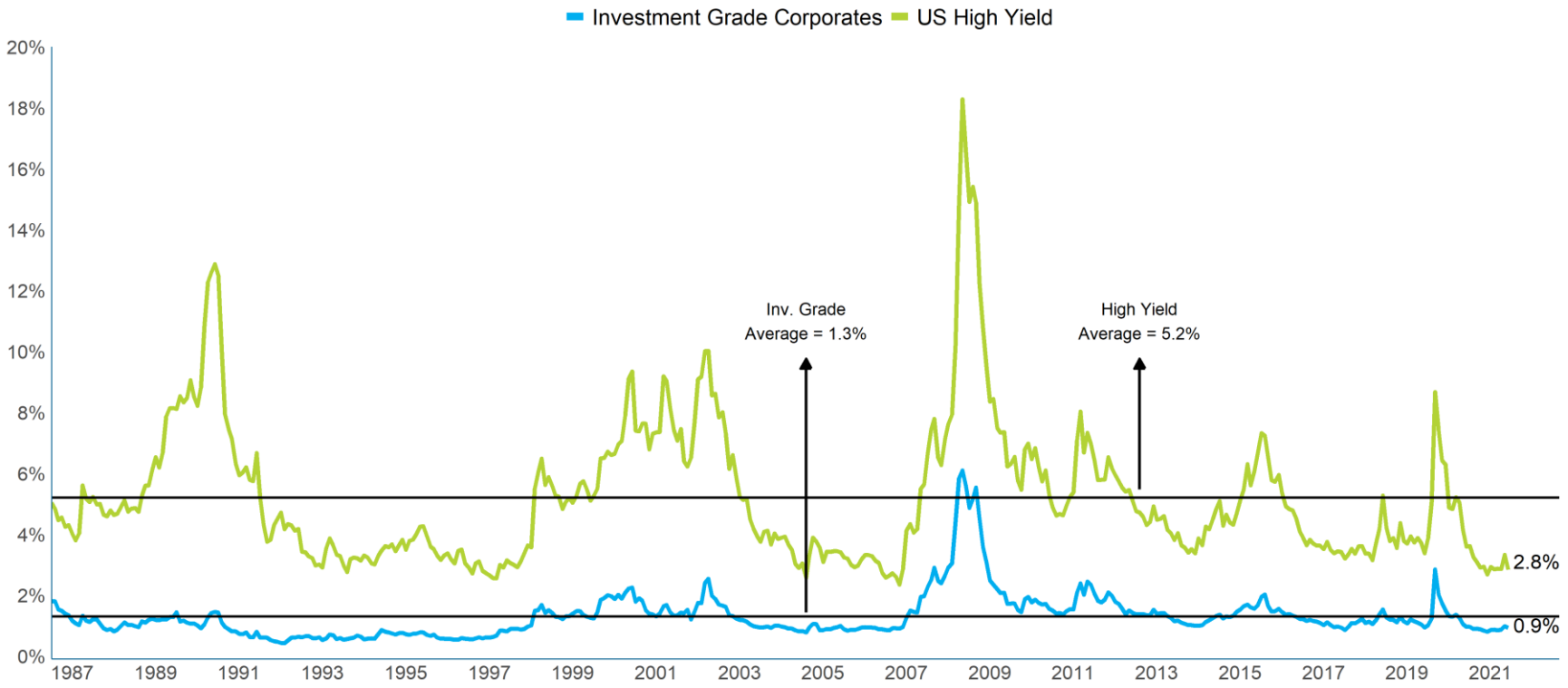
REITs Dividend Yield Spread vs. Ten-Year Treasury[1]
(As of December 31, 2021)



- This chart details one valuation metric for the public REITs market. A higher (lower) figure indicates cheaper (more expensive) valuation.

[1] REITs Dividend Yield Spread vs. Ten-Year Treasury – Source: NAREIT, US Treasury. REITs are proxied by the yield for the NAREIT Equity Index.

Credit Spreads[1]
(As of December 31, 2021)



- This chart details one valuation metric for the US credit markets. A higher (lower) figure indicates cheaper (more expensive) valuation relative to history.

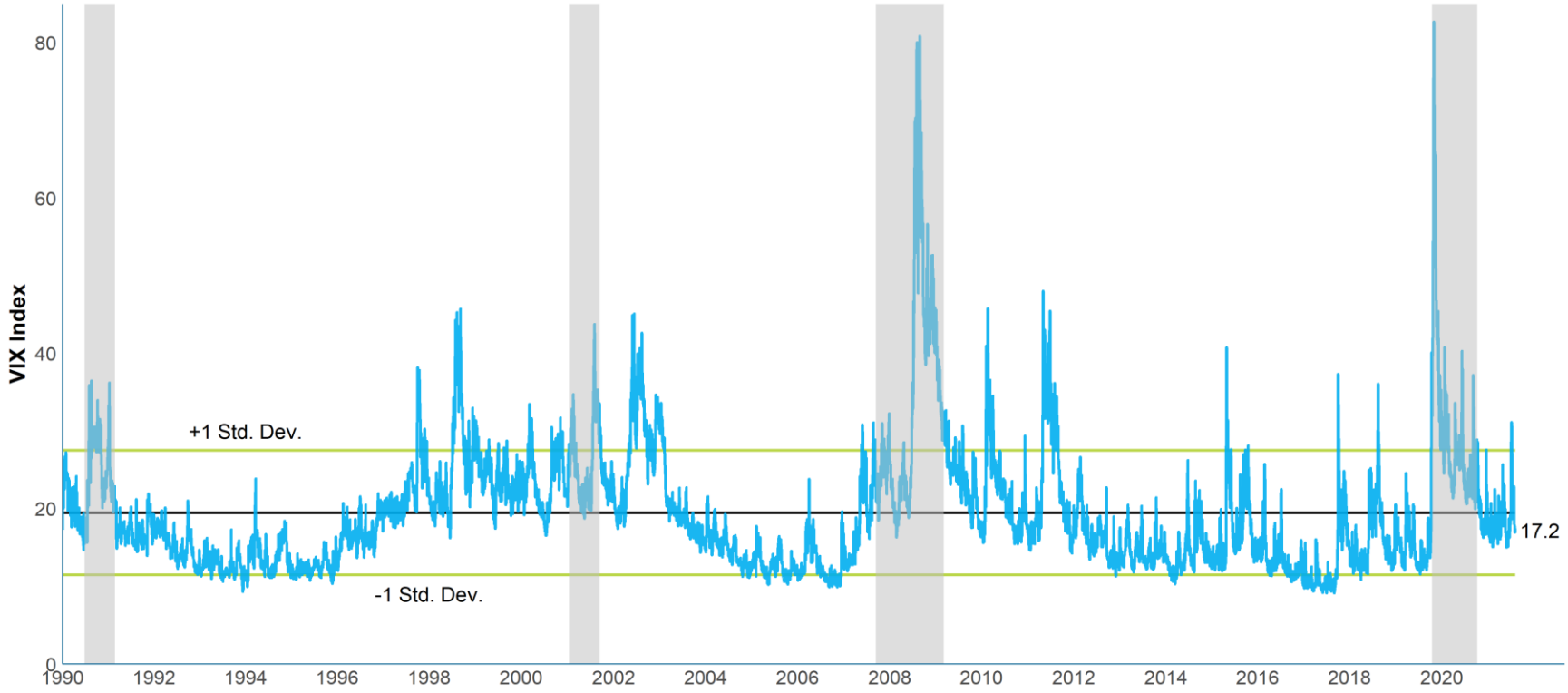
[1] Credit Spreads – Source: Bloomberg. High Yield is proxied by the Bloomberg High Yield Index and Investment Grade Corporates are proxied by the Bloomberg US Corporate Investment Grade Index. Spread is calculated as the difference between the Yield to Worst of the respective index and the 10-Year US Treasury yield.

Emerging Market Debt Spreads[1]
(As of December 31, 2021)

- This chart details one valuation metric for the EM debt markets. A higher (lower) figure indicates cheaper (more expensive) valuation relative to history.

[1] EM Spreads – Source: Bloomberg. Option Adjusted Spread (OAS) for the Bloomberg EM USD Aggregate Index.

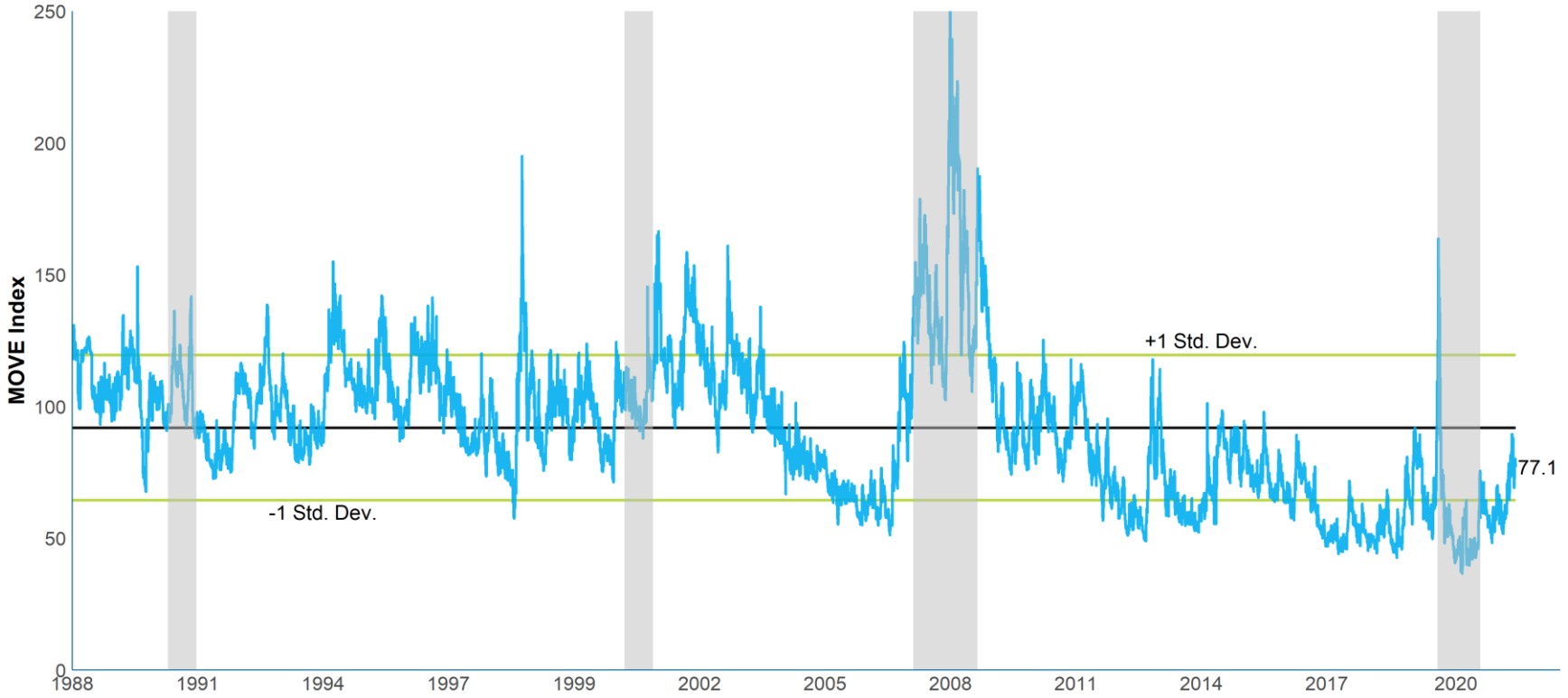
Equity Volatility[1]
(As of December 31, 2021)



- This chart details historical implied equity market volatility. This metric tends to increase during times of stress/fear and while declining during more benign periods.

[1] Equity Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by VIX Index, a Measure of implied option volatility for US equity markets.

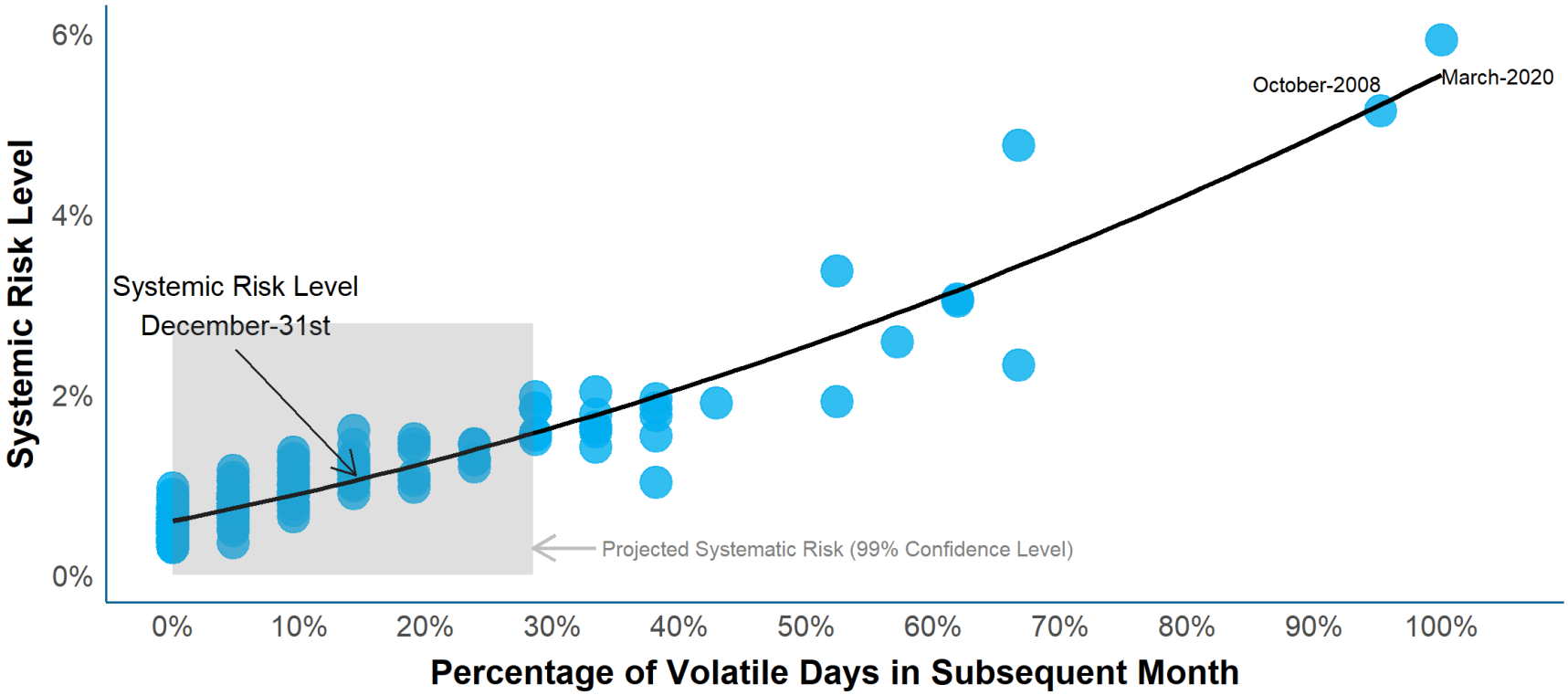
Fixed Income Volatility[1]
(As of December 31, 2021)



- This chart details historical implied fixed income market volatility. This metric tends to increase during times of stress/fear and while declining during more benign periods.

[1] Fixed Income Volatility – Source: Bloomberg, and Meketa Investment Group. Fixed Income Volatility proxied by MOVE Index, a Measure of implied option volatility for US Treasury markets.

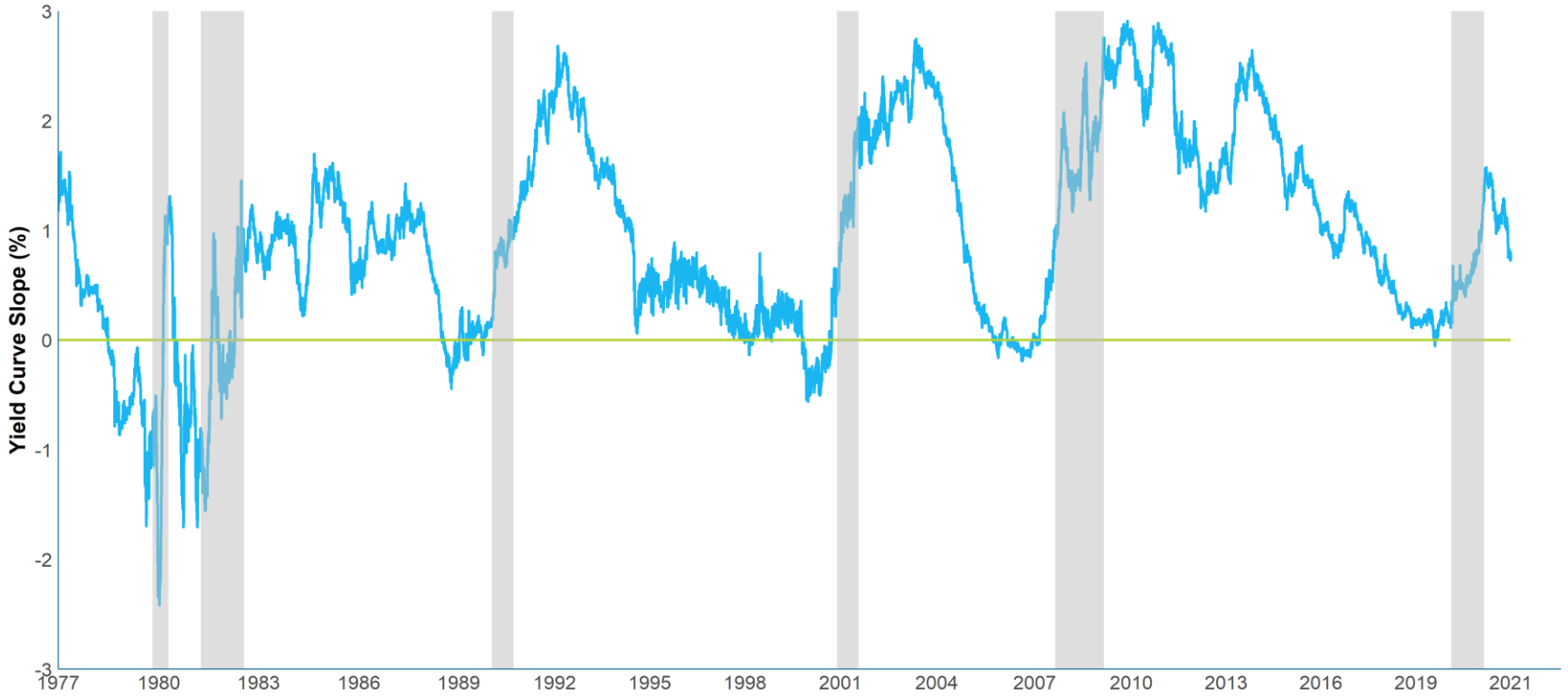
Systemic Risk and Volatile Market Days[1]
(As of December 31, 2021)



- Systemic Risk is a measure of 'System-wide' risk, which indicates herding type behavior.

[1] Source: Meketa Investment Group. Volatile days are defined as the top 10 percent of realized turbulence, which is a multivariate distance between asset returns.

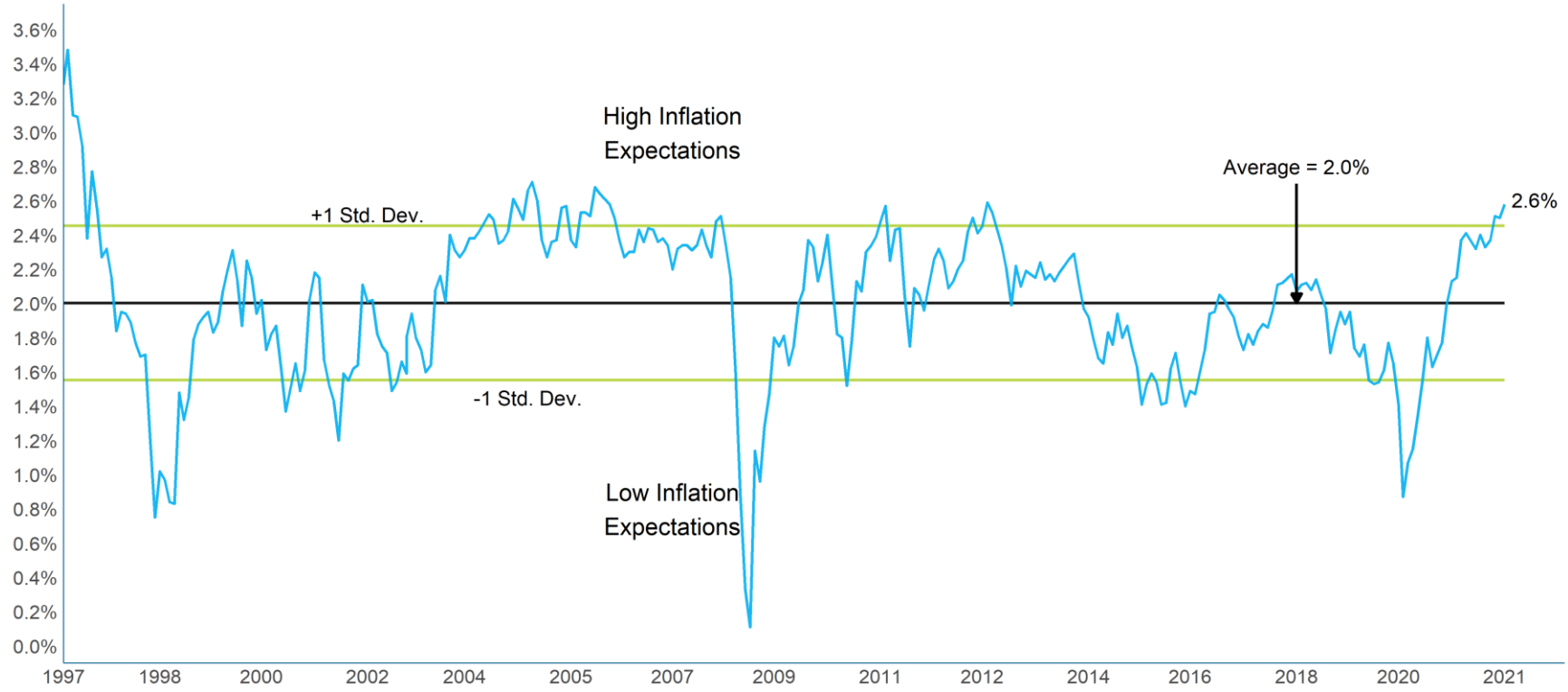
Yield Curve Slope (Ten Minus Two)[1]
(As of December 31, 2021)



- This chart details the historical difference in yields between ten-year and two-year US Treasury bonds/notes. A higher (lower) figure indicates a steeper (flatter) yield curve slope.

[1] Yield Curve Slope (Ten Minus Two) – Source: Bloomberg, and Meketa Investment Group. Yield curve slope is calculated as the difference between the 10-Year US Treasury Yield and 2-Year US Treasury Yield.

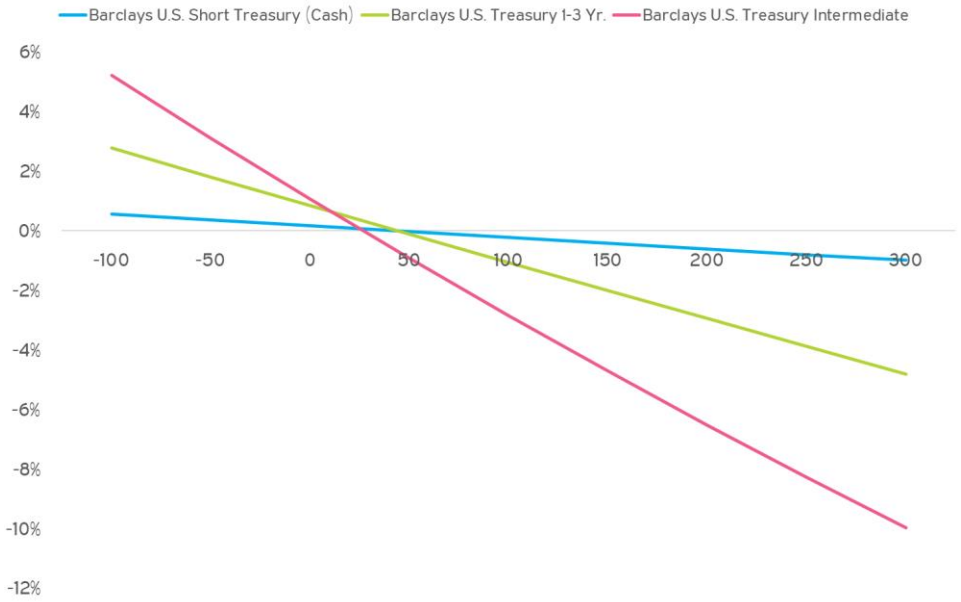
Ten-Year Breakeven Inflation[1]
(As of December 31, 2021)



- This chart details the difference between nominal and inflation-adjusted US Treasury bonds. A higher (lower) figure indicates higher (lower) inflation expectations.

[1] Ten-Year Breakeven Inflation – Source: US Treasury and Federal Reserve. Inflation is measured by the Consumer Price Index (CPI-U NSA).

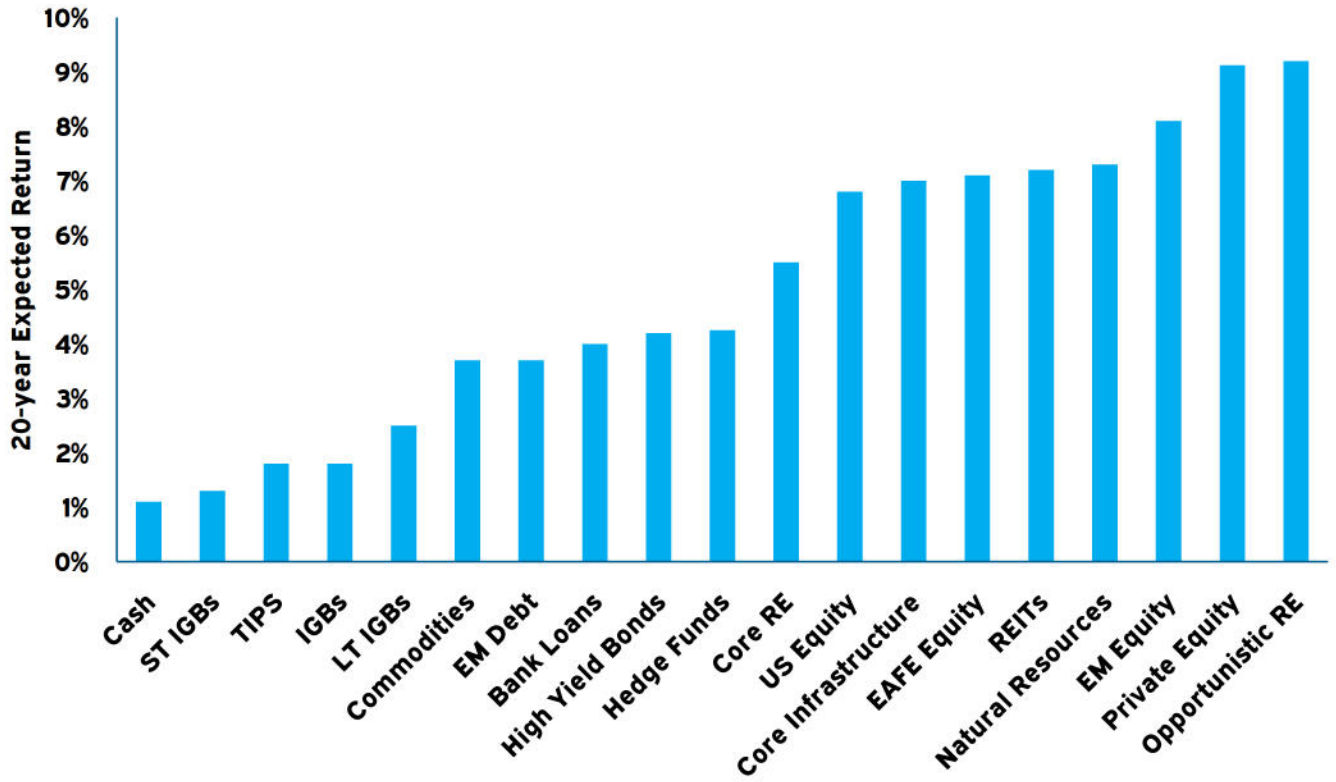
Total Return Given Changes in Interest Rates (bps)[1]
(As of December 31, 2021)



	Total Return for Given Changes in Interest Rates (bps)									Statistics	
	-100	-50	0	50	100	150	200	250	300	Duration	YTW
Barclays US Short Treasury (Cash)	0.5%	0.3%	0.1%	0.0%	-0.2%	-0.4%	-0.6%	-0.8%	-1.0%	0.39	0.15%
Barclays US Treasury 1-3 Yr.	2.8%	1.8%	0.8%	-0.1%	-1.1%	-2.0%	-3.0%	-3.9%	-4.8%	1.92	0.83%
Barclays US Treasury Intermediate	5.2%	3.1%	1.1%	-0.9%	-2.9%	-4.7%	-6.5%	-8.3%	-10.0%	4.03	1.05%
Barclays US Treasury Long	22.6%	11.7%	1.9%	-6.9%	-14.6%	-21.2%	-26.8%	-31.3%	-34.8%	18.61	1.89%

[1] Data represents the expected total return from a given change in interest rates (shown in basis points) over a 12-month period assuming a parallel shift in rates. Source: Bloomberg, and Meketa Investment Group.

Long-Term Outlook – 20-Year Annualized Expected Returns[1]



- This chart details Meketa's long-term forward-looking expectations for total returns across asset classes.

[1] Source: Meketa Investment Group's 2021 Annual Asset Study.

Appendix

Data Sources and Explanations[1]

- US Equity Cyclically Adjusted P/E on S&P 500 Index – Source: Robert Shiller and Yale University.
- Small Cap P/E (Russell 2000 Index) vs. Large Cap P/E (Russell 1000 Index) - Source: Russell Investments. Earnings figures represent 12-month "as reported" earnings.
- Growth P/E (Russell 3000 Growth Index) vs. Value (Russell 3000 Value Index) P/E - Source: Bloomberg, MSCI, and Meketa Investment Group. Earnings figures represent 12-month "as reported" earnings.
- Developed International Equity (MSCI EAFE) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years.
- Emerging Market Equity (MSCI Emerging Markets Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years.
- Private Equity Multiples – Source: S&P LCD Average EBITDA Multiples Paid in All LBOs.
- Core Real Estate Spread vs. Ten-Year Treasury – Source: Real Capital Analytics, US Treasury, Bloomberg, and Meketa Investment Group. Core Real Estate is proxied by weighted sector transaction-based indices from Real Capital Analytics and Meketa Investment Group.

[1] All Data as of October 31, 2021 unless otherwise noted.

Appendix

Data Sources and Explanations[1]

- REITs Dividend Yield Spread vs. Ten-Year Treasury – Source: NAREIT, US Treasury. REITs are proxied by the yield for the NAREIT Equity Index.
- Credit Spreads – Source: Bloomberg High Yield is proxied by the Bloomberg High Yield Index and Investment Grade Corporates are proxied by the Bloomberg US Corporate Investment Grade Index.
  - Spread is calculated as the difference between the Yield to Worst of the respective index and the 10-Year Treasury Yield.
- EM Debt Spreads – Source: Bloomberg, and Meketa Investment Group. Option Adjusted Spread (OAS) for the Bloomberg EM USD Aggregate Index.
- Equity Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by VIX Index, a Measure of implied option volatility for US equity markets.
- Fixed Income Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by MOVE Index, a Measure of implied option volatility for US Treasury markets.
- Systemic Risk and Volatile Market Days – Source: Meketa Investment Group. Volatile days are defined as the top 10 percent of realized turbulence, which is a multivariate distance between asset returns.
- Systemic Risk, which measures risk across markets, is important because the more contagion of risk that exists between assets, the more likely it is that markets will experience volatile periods.

[1] All Data as of October 31, 2021 unless otherwise noted.

Appendix

Data Sources and Explanations[1]

- Yield Curve Slope (Ten Minus Two) – Source: Bloomberg, and Meketa Investment Group. Yield curve slope is calculated as the difference between the 10-Year US Treasury Yield and 2-Year US Treasury Yield.
- Ten-Year Breakeven Inflation – Source: US Treasury and Federal Reserve. Inflation is measured by the Consumer Price Index (CPI-U NSA).

[1] All Data as of October 31, 2021 unless otherwise noted.

Meketa Market Sentiment Indicator

Explanation, Construction and Q&A

Meketa has created the MIG Market Sentiment Indicator (MIG-MSI) to complement our valuation-focused Risk Metrics. This measure of sentiment is meant to capture significant and persistent shifts in long-lived market trends of economic growth risk, either towards a risk-seeking trend or a risk-aversion trend.

This appendix explores:

- What is the Meketa Market Sentiment Indicator?
- How do I read the indicator graph?
- How is the Meketa Market Sentiment Indicator constructed?
- What do changes in the indicator mean?

Meketa has created a market sentiment indicator for monthly publication (the MIG-MSI – see below) to complement Meketa's Risk Metrics.

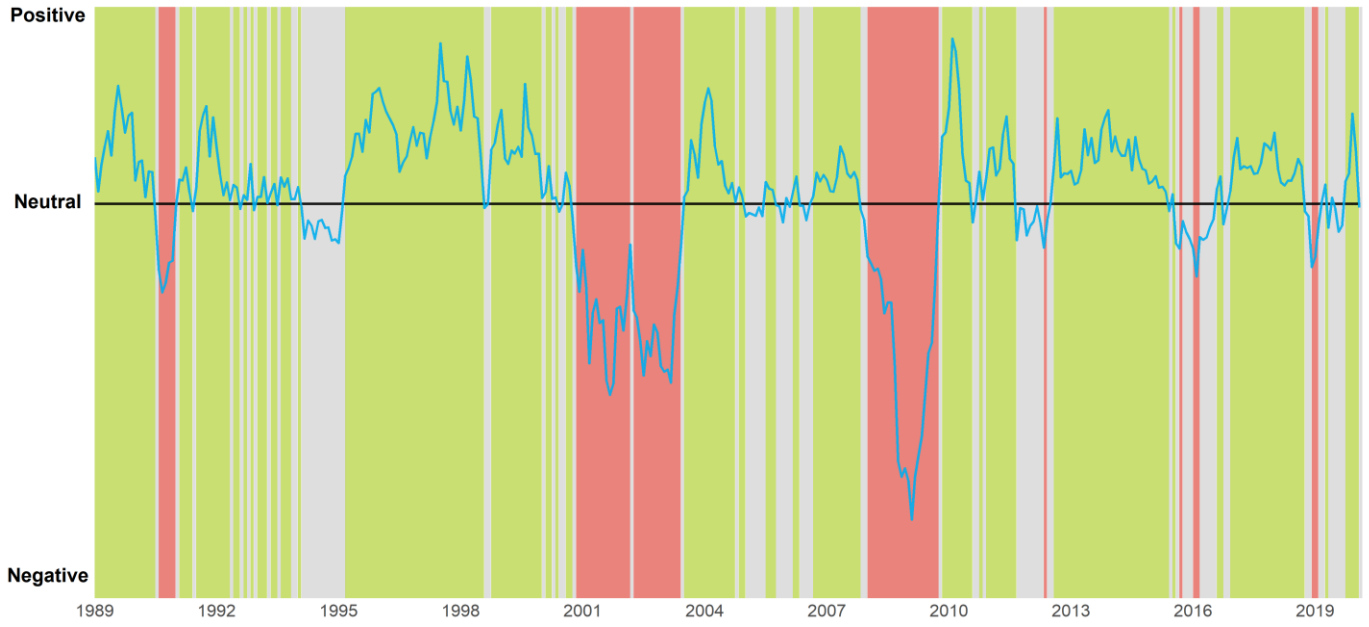
- Meketa's Risk Metrics, which rely significantly on standard market measures of relative valuation, often provide valid early signals of increasing long-term risk levels in the global investment markets. However, as is the case with numerous valuation measures, the Risk Metrics may convey such risk concerns long before a market correction take place. The MIG-MSI helps to address this early-warning bias by measuring whether the markets are beginning to acknowledge key Risk Metrics trends, and / or indicating non-valuation-based concerns. Once the MIG-MSI indicates that the market sentiment has shifted, it is our belief that investors should consider significant action, particularly if confirmed by the Risk Metrics. Importantly, Meketa believes the Risk Metrics and MIG-MSI should always be used in conjunction with one another and never in isolation. The questions and answers below highlight and discuss the basic underpinnings of the Meketa MIG-MSI:

What is the Meketa Market Sentiment Indicator (MIG-MSI)?

- The MIG-MSI is a measure meant to gauge the market's sentiment regarding economic growth risk. Growth risk cuts across most financial assets and is the largest risk exposure that most portfolios bear. The MIG-MSI takes into account the momentum (trend over time, positive or negative) of the economic growth risk exposure of publicly traded stocks and bonds, as a signal of the future direction of growth risk returns; either positive (risk seeking market sentiment), or negative (risk averse market sentiment).

How do I read the Meketa Market Sentiment Indicator graph?

- Simply put, the MIG-MSI is a color-coded indicator that signals the market's sentiment regarding economic growth risk. It is read left to right chronologically. A green indicator on the MIG-MSI indicates that the market's sentiment towards growth risk is positive. A gray indicator indicates that the market's sentiment towards growth risk is neutral or inconclusive. A red indicator indicates that the market's sentiment towards growth risk is negative. The black line on the graph is the level of the MIG-MSI. The degree of the signal above or below the neutral reading is an indication the signal's current strength.
- Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.



How is the Meketa Market Sentiment Indicator (MIG-MSI) Constructed?

- The MIG-MSI is constructed from two sub-elements representing investor sentiment in stocks and bonds:
  - Stock return momentum: Return momentum for the S&P 500 Equity Index (trailing 12-months).
  - Bond yield spread momentum: Momentum of bond yield spreads (excess of the measured bond yield over the identical duration US Treasury bond yield) for corporate bonds (trailing 12-months) for both investment grade bonds (75% weight) and high yield bonds (25% weight).
  - Both measures are converted to Z-scores and then combined to get an "apples to apples" comparison without the need of re-scaling.
- The black line reading on the graph is calculated as the average of the stock return momentum measure and the bonds spread momentum measure[1]. The color reading on the graph is determined as follows:
  - If both stock return momentum and bond spread momentum are positive = GREEN (positive).
  - If one of the momentum indicators is positive, and the other negative = GRAY (inconclusive).
  - If both stock return momentum and bond spread momentum are negative = RED (negative).

[1] Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.
"Time Series Momentum" Moskowitz, Ooi, Pedersen, August 2010. *http://pages.stern.nyu.edu/~lpederse/papers/TimeSeriesMomentum.pdf*

What does the Meketa Market Sentiment Indicator (MIG-MSI) mean? Why might it be useful?

- There is strong evidence that time series momentum is significant and persistent. Across an extensive array of asset classes, the sign of the trailing 12-month return (positive or negative) is indicative of future returns (positive or negative) over the next 12-month period. The MIG-MSI is constructed to measure this momentum in stocks and corporate bond spreads. A reading of green or red is agreement of both the equity and bond measures, indicating that it is likely that this trend (positive or negative) will continue over the next 12 months. When the measures disagree, the indicator turns gray. A gray reading does not necessarily mean a new trend is occurring, as the indicator may move back to green, or into the red from there. The level of the reading (black line) and the number of months at the red or green reading, gives the user additional information on which to form an opinion, and potentially take action.

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Board of Retirement Meeting

San Joaquin County Employees' Retirement Association

Agenda Item 10.01

January 21, 2022

SUBJECT: Pending Member Accounts Receivable – 4th Quarter

SUBMITTED FOR: ___ CONSENT __ ACTION __X_ INFORMATION

RECOMMENDATION

This report is submitted for the Board's information.

PURPOSE

To report the quarterly summary of pending accounts receivables for SJCERA retired or deferred members as of December 31, 2021.

DISCUSSION

This quarter's Pending Accounts Receivable Report, below, includes all receivables owed by either retirees, beneficiaries or deferred members.

QUARTERLY SUMMARY REPORT OF PENDING ACCOUNTS RECEIVABLE - SJCERA MEMBERS

4th Quarter - October through December 2021

	Action Date	Total Receivable	Payments Began	Current Balance	Current Payment	Payment Description	Payment End Date	First Reported To Board
1	07/15/09	$11,475.48	05/01/11	$7,610.93	$163.00	Fixed Dollar Amount	10/01/25	Jul-11
2	09/01/12	$13,580.90	02/01/14	$6,821.34	$297.00	Fixed Dollar Amount	11/01/24	Apr-14
3	05/19/02	$35,537.23	11/01/15	$17,535.08	$284.59	Fixed Dollar Amount	12/01/27	Jan-16
4	06/15/21	$715.95	07/01/21	$357.97	$357.98	Fixed Dollar Amount	TBD	Jul-21
5	03/11/21	$12,035.49	06/01/21	$9,690.49	$335.00	Fixed Dollar Amount	05/01/24	Apr-21
6	04/12/21	$180.95	06/01/21	$30.15	$30.15	Fixed Dollar Amount	TBD	May-21
7	10/01/21	$2,040.00	10/01/21	$1,359.99	$226.67	Fixed Dollar Amount	06/01/22	Jan-22
	Total Accounts Receivable as of 12/31/21			$43,405.95				

The 2021 benefit adjustments, as a result of the Alameda decision, created $116,772.92 in receivables. Of this amount, $9,720.64 is still outstanding because one member requested an extended period of time to repay the overpayment and one passed away. One new receivable, number seven above is the result of a Medicare Part B reimbursement overpayment and will be resolved within the next six months.

Kathy Herman

KATHY HERMAN
Asst. Chief Executive Officer

Pending Disability Application Statistics
4th Quarter 2021
Open Cases

Time Elapsed From Application Date	
01- 03 Months	5
04- 06 Months	3
07- 09 Months	3
10 - 12 Months	4
13 - 15 Months	0
16 - 18 Months	0
19 - 21 Months	0
22 - 24 Months	0
Over 24 Months	0
Total	**15**

Break Down By Application Type	
Service-Connected	13
Nonservice Connected	1
Service & Nonservice Connected	1
Total	**15**

Breakdown By Department	Service	Nonservice	Service & Nonservice	Total	SJCERA Members	Ratio
Child Support	1	0	0	1	179	0.56%
Courts	1	1	0	2	19	10.53%
Hospital	1	0	1	2	1,004	0.20%
Health Services Agency	0	0	1	1	908	0.11%
Probation	1	0	0	1	264	0.38%
Public Works	2	0	0	2	370	0.54%
Sheriff	6	0	0	6	806	0.74%
Totals	12	1	2	15	3,550	0.42%
	Total SJCERA Active Members For All Departments As of 12/31/2021				**6,333**	**0.24%**
			Total Number of Department Groups		**7**	

2021 Total Cases Resolved = 11

Goal #1 - 100% of applications that do not require a hearing will go to the Board within 9 months
Goal #2 - 80% of applications requiring a hearing will go to the Board within 18 months

Goal #1 66% Completed within 9 months
Goal #2 40% Completed with Hearing within 18 months

Of the eleven cases that have been resolved in 2021, six were completed without a hearing. Four were completed in less than nine months, meeting Goal # 1. Goal #2 is at 40%, up from 25% in 2nd quarter. Five cases required hearings, two were completed within the goal of 18 months. Delays and/or extensions caused by the applicants, SJCERA's change in policy, change in fund counsel and COVID concerns attributed to the extended processing time of these applications. Wherever SJCERA has control, these issues have been addressed.

Calendar Year Comparison
1/1 to 12/31

	2017	2018	2019	2020	2021
New	37	41	13	7	16
Granted	27	21	19	10	8
Denied	6	3	2	4	3
Dismissed	11	4	6	2	0
Withdrawn	5	0	4	0	0
Total Closed	49	28	31	16	11

2022 CONFERENCES AND EVENTS SCHEDULE 2022

EVENT DATES 2022		EVENT TITLE	EVENT SPONSOR	LOCATION	REG.	WEBLINK	EST. BOARD EDUCATION HOURS
BEGIN	END				FEE	FOR MORE INFO	
Feb 11	Feb 11	Administrators' Round Table	CALAPRS	Webinar	$50	calaprs.org	5 hrs*
Feb 18	Feb 18	Attorneys Round Table	CALAPRS	Webinar	$50	calaprs.org	4 hrs*
Mar 5	Mar 8	General Assembly 2022	CALAPRS	TBD	$150	calaprs.org	10.5*
Mar 15	Mar 15	Investments Round Table	CALAPRS	Webinar	$50	calaprs.org	4 hrs*
Mar 30	Apr 1	Advanced Principles of Pension Governance for Trustees	CALAPRS	Los Angeles, CA	$500	calaprs.org	9 hrs*
Apr 18	Apr 20	Pension Bridge Annual Conference	Pension Bridge	San Francisco, CA	N/A	Pension Bridge	14.4 hrs*
Apr 29	Apr 29	Trustees Round Table	CALAPRS	Webinar	$50	calaprs.org	5 hrs*
May 10	May 13	SACRS Spring Conference	SACRS	Rancho Mirage, CA	$120	sacrs.org	11 hrs*
Nov 8	Nov 11	SACRS Fall Conference	SACRS	Long Beach, CA	$120	sacrs.org	11 hrs*

** Estimates based on prior agendas*

FOCUSING ON THE FUTURE

Creating and Sustaining Success

CALAPRS

EDUCATION · COMMUNICATION · NETWORKING

California Association of Public Retirement Systems

2022 General Assembly

March 5 – March 8, 2022

Mission Bay Resort, San Diego, CA

The California Association of Public Retirement Systems (CALAPRS) invites you to attend the Annual General Assembly, March 5 - March 8, 2022 in sunny San Diego at the San Diego Mission Bay Resort! The General Assembly is an educational conference for retirement system trustees, senior staff, and our annual sponsors. This year, we're planning a safe return to the in-person format - attendees will learn from experts and peers, while getting the opportunity to greet their colleagues face-to-face and network.

REGISTRATION

Register online at www.calaprs.org/events.

- **Retirement System Fee:** $250/person
- **Sponsor Fee:** Complimentary for up to 2 representatives*

**Annual sponsorship required.*

LODGING

CALAPRS has arranged for a discounted room rate at the meeting hotel, the San Diego Mission Bay Resort for the duration of the meeting.

Room Rate: $229/night, plus taxes and fees*
Book Online:
https://bit.ly/SDMissionBay_CALAPRSGA22
By Phone: 877-259-0010; Group Code: CAL304

**The regular resort rate of $36/night is waived for those who book under the CALAPRS discounted rate.*

Cut-off Date: The room rate is available until February 2, 2022 or until the block is sold out, whichever comes first.

SPONSORSHIP

Sign-up to Sponsor at www.calaprs.org/sponsors.

Fee: $2,500
Sponsor Benefits:

- (2) Two complimentary registrations to the General Assembly
- Access to the CALAPRS Systems Directory
- A company listing in the CALAPRS Sponsor directory
- Subscription to the semi-annual CALAPRS Newsletter

HEALTH & SAFETY

CALAPRS is dedicated to providing a safe event experience for all participants involved including attendees, sponsors, staff, and guests. CALAPRS will conduct the General Assembly as advised by government (local, state, and national) regulations, CDC recommendations, and venue requirements at the time of the event. This may include, but is not limited to social distancing, requiring proof of vaccination, or wearing a face covering. CALAPRS will continue to monitor guidelines for safe in-person events. Requirements for attendance are subject to change.

PROGRAM

SATURDAY, MARCH 5

4:00 – 6:00 PM Early-Bird Registration

SUNDAY, MARCH 6

10:00 AM – 5:00 PM Registration Open

10:00 AM – 12:00 PM **AB1234 Ethics for Trustees**
This two hour mandatory bi-annual training for public officials covers conflict of interest rules, public meeting and record requirements, due process requirements and other significant rules for legal compliance by public officials, with a particular focus on how these rules apply to retirement board trustees and senior staff. Note - this session is designed for system trustees and senior staff.
Speaker: Ashley Dunning, Partner, Nossaman LLP

2:00 – 2:15 PM **Welcome Remarks**
Speakers: Johanna Shick, CEO, San Joaquin County Employees Retirement Association (SJCERA) and General Assembly Conference Chair; and Carl Nelson, CEO, San Luis Obispo County Pension Trust and CALAPRS President

2:15 – 3:15 PM **Issues Facing Pension Plans: A Fireside Chat with Hank Kim, Esq. and Kristen Santos, Administrator**
What is top of mind for our trustees and system administrators alike? During this fireside chat, we'll hear about what is most concerning for public pension systems from varying perspectives – statewide, medium-sized pensions, and smaller/rural pensions.
Moderator: Steve Delaney, CEO, Orange County Employees Retirement System (OCERS)
Speakers: Hank Kim, Esq., Executive Director and Counsel, National Conference on Public Employee Retirement Systems (NCPERS) and Kristen Santos, Administrator, Merced County Employees' Retirement Association (MCERA)

3:15 – 3:30 PM Networking Break

3:30 – 4:30 PM **How Inflation will Impact Your Portfolio**
During this session Jack Ross will discuss what pension systems should be aware of as they manage their portfolios in the coming year. How will real assets portfolios be impacted by higher inflation and what does it mean for the remainder of the portfolio? What are the unforeseen risks on the portfolio? How might asset allocations need to change if we have sustained inflation? How are investors measuring the impacts of higher inflation on their portfolios? These are just some of the questions that will be addressed.
Speaker: Jack Ross, Managing Partner and Co-founder, Waterfall Asset Management

7:00 – 9:30 PM **Strolling Dinner at San Diego Mission Bay Resort** *(outdoor venue)*
System attendees may bring a guest to the Strolling Dinner. Please contact info@calaprs.org to add your guest to your registration.

MONDAY, MARCH 7

7:00 AM – 4:00 PM Registration Open

7:15 – 8:15 AM Breakfast *(outdoor venue)*

8:15 – 8:30 AM **Opening Remarks**
Speaker: Johanna Shick, CEO, San Joaquin County Employees Retirement Association (SJCERA) and General Assembly Conference Chair

8:30 – 9:30 AM **Keynote Session featuring Kristina Hooper, Chief Global Market Strategist, Invesco**
During this session, Kristina Hooper will cover her current macro outlook for 2022, including fiscal and monetary policy, asset class implications based on her base case outlook, as well as implications for tail risk scenarios and key investment themes.

9:30 – 10:00 AM Networking Break

10:00 – 11:00 AM **So Your System is Fully-Funded – What Now?**
Recent record investment returns improved pension systems' funding, in some cases to full (or nearly full) funding. While full funding has been our goal, it presents challenges that most systems haven't contemplated in more than a decade. This panel of actuaries and investment consultants will discuss the policy and implementation considerations Boards and staff should consider. Should systems lower the return assumption? De-risk the portfolio? Establish a rainy-day reserve? What about amortization layers? Do these policy decisions affect members and employers differently? How do we manage potential pressure for benefit increases, contribution holidays? Alternatively, what happens if you stay the course and maintain your current policy?
Moderator: Jeff Wickman, Administrator, Marin County Employees' Retirement Association (MCERA)
Panelists: Paul Angelo, Senior Vice President and Actuary, The Segal Group; Graham Schmidt, ASA, Consulting Actuary, Cheiron; Jeff MacLean, CEO, Verus; and Steve McCourt, CFA, Managing Principal / Co-CEO, Meketa

11:00 AM – 12:00 PM **Delegating to the Investment Staff**
Some argue pension systems are increasing their delegation of asset management duties, but how are those functions delegated and how does that affect the overall governance of the organization. Who determines the investment strategies of a plan and how they're implemented to ensure the success of plan assets? In this session, participants will hear from a number of investment professionals to discuss how the practice has changed within their systems, lessons learned, challenges, and successes.
Moderator: Roberto Peña, CEO, San Jose City Retirement Plans
Panelists: Shawn Dewane, CIO, OCERS; Allan Emkin, Meketa Investment Gorup; Drew Lanza, San Jose City P&F Retirement Plan Chair; Prabhu Palani, CIO, San Jose City Retirement Plans; and Tim Price, CIO, Contra Costa County Employees' Retirement Association (CCCERA)

12:00 – 1:30 PM Lunch *(outdoor venue)*

1:30 – 2:30 PM **Using A.I. in Retirement Administration**
Artificial Intelligence is no longer a what-if, a myth, or some far-off idea that won't come to fruition until later in the future. It's being used NOW and used by many retirement systems worldwide, as well as by our supporting partners. So - what *are* they doing? Hear from pension plans, investment managers, and our partners in the private sector to hear about how they are using AI now and how you can implement it in your own organizations.

2:30 – 3:00 PM Networking Break

MONDAY, MARCH 7 *(continued)*

3:00 – 4:00 PM

Death Verification
Timely detection of unreported deaths, and the resulting overpaid benefits, is an issue facing many sectors of the financial services industry including public pension systems. Come hear what steps CalPERS is taking to identify unreported deaths, confirm the living status of benefit recipients, locate beneficiaries and collect overpayments.
Moderator: Anthony Suine, Deputy Executive Officer, Customer Services & Support, California Public Employees' Retirement System (CalPERS)
Speakers: Roger Fujita, Assistant Division Chief, Disability and Survivor Benefits Division; and Tiffany Triplett, Section Manager, Disability and Survivor Benefits Division, California Public Employees' Retirement System (CalPERS)

5:00 – 6:00 PM Networking Reception *(outdoor venue)*

TUESDAY, MARCH 8

7:30 - 10:30 AM Registration Open

7:30 – 8:30 AM Breakfast *(outdoor venue)*

8:30 – 9:30 AM

Succession Planning in the Public Pension Sector—Developing the Leadership
At the Board, executive, and staff levels, effective leadership and continuity of talent are key to your organization's success. Too often, we hear succession planning isn't possible in the public sector or, alternatively, the organization's succession plan consists primarily of, "Call the recruiter" or "Hopefully the Board of Supervisors appoints someone who knows about investments to the Board." This panel will discuss the programs and practices your organization can put in place now at the Board, Executive, and staff levels to help ensure there are well-qualified people ready, willing and able to step forward when turnover occurs.
Moderator: Johanna Shick, CEO, San Joaquin County Employees' Retirement Association (SJCERA)
Panelists: Amy McDuffee, Founder and CEO, Mosaic Governance Advisors; Melissa Norcia, Chief Administrative Officer, CalSTRS; and Debra Smith, CEO, Montage Careers

9:30 – 10:00 AM Networking Break

10:00 – 11:00 AM

Cybersecurity and the Retirement System – What You Can do NOW to Protect Your Organization
We've heard it before and we all know that cyber crimes are not something to take lightly, but what can our systems do now to protect ourselves, especially now that most have transitioned to a fully virtual or hybrid workplace? During this session, panelists will provide tangible best practices that our public pension systems should adopt to ensure they're secure.
Moderator: Vijay Jagar, CTO, Alameda County Employees' Retirement Association (ACERA)
Panelists: Matt Eakin, CISSP, CCSP, CEH, Director of Cyber Security, Orange County Employees' Retirement System (OCERS); Harsh Jadhav, Chief of Internal Audit, Alameda County Employees' Retirement Association (ACERA); and James Vorhis, Co-Chair, Insurance Recovery & Counseling Group, Nossaman LLP

11:00 AM

Closing Remarks
Speaker: Johanna Shick, CEO, San Joaquin County Employees' Retirement Association (SJCERA)

GENERAL ASSEMBLY PLANNING COMMITTEE: Johanna Shick, SJCERA (Chair); Steve Delaney, OCERS; Scott Hood, SamCERA; David Nelsen, ACERA; Roberto Peña, San Jose City Retirement Plans; Kristen Santos, MercedCERA; and Anthony Suine, CalPERS

with.
Intelligence

Pension Bridge Annual 2022

April 18th - 20th, San Francisco

events.withintelligence.com/pensionbridgetheannual

After 2 years running virtual events, we're excited to be returning to San Francisco in the spring of 2022, to bring you, once again, the Pension Bridge Annual!

With our return to physical conference, comes a new look for Pension Bridge. Having united with Pageant Media's other titles – Falk Marques Group, HFM, Fund Intelligence and others – Pension Bridge is now part of one, new, global brand - With Intelligence. But be rest assured, while the Annual might look a little different it's still the same event you have known and loved for the past 17 years! We are very excited to start this new chapter and can't wait for you to be a part of it!

This year's agenda will focus on structural transformations and investment ideas that will be beneficial for long-term fiscal sustainability, as we continue to find ourselves in a low return environment with lofty valuations by all historical metrics. As with previous editions, attendees will benefit from dedicated sessions on each of the traditional and alternative asset classes as well as topical issues such as ESG, Diversity, Equity and Inclusion, cybersecurity and new for 2022 the impacts, risks, and opportunities of climate change.

As always, we will maintain our controlled attendance structure, which our conferences are famous for, ensuring a 1:1 ratio of investors/investments consultants to manager attendees. There will be over 250 allocators and non-discretionary consultants in attendance, with a limit of only 130 manager firms. This favorable ratio, combined with participation from the most influential industry figures, creates a vibrant and enjoyable environment for all!

The Pension Bridge Annual has Two Goals in Mind

First is to provide the highest level of education with the top experts from the industry. Our speakers will inspire with influential insights on how to invest for outperformance while positioning defensively.

The second goal is to help build relationships between the allocators, consultants, and managers. Through relaxed breakout sessions, networking lunches and dinners, as well as 2 evening cocktail receptions, this conference is designed to enable you to forge new and develop existing relationships with your peers, colleagues, and prospective business contacts.

We look forward to bringing you back together again this year for a dynamic and productive conference. We hope that you will join us and be amongst your industry peers to learn about the most up-to-date insights, investment strategies and trends.

Sessions

Monday, April 18th
Westin St. Francis, San Francisco

4:00 PM – 5:00 PM
Investor Only Roundtable

In this LP only session investors will hear about key findings from an investor-only survey conducted by With Intelligence. This is the perfect way to kickoff your Summit experience. Network with your peers while enjoying a cocktail. Attendance is limited and RSVP is required.

5:00 PM – 6:30 PM
Registration / Cocktail Reception

Tuesday, April 19th
Westin St. Francis, San Francisco

7:30 AM – 8:30 AM
Registration / Breakfast

8:35 AM – 8:40 AM
Opening Remarks

8:40 AM - 9:05 AM
Keynote Speaker

9:05 AM – 9:35 AM
Lead/Headline Sponsor

9:35 AM – 10:15 AM
Asset Allocation and Risk Management
Producing the Optimal Asset Mix

Creating a proper asset allocation mix is the backbone of any portfolio. But what due diligence needs to be done – especially as the world has changed over the past two to three years – to ensure there are no unforeseen risks lurking?

- What have we Learned to Better Understand the Underlying Risk Factor Exposures in the Portfolio?
- What are you doing Differently in your Portfolio? What is the Reason behind this Change in Orientation?
- Given Low Return Expectations, are you taking More Risk, or Stay Consistent and Re-Assessing Once Markets look more Attractive?
- Are we still too Over-Reliant on Equities? How should Allocators think about the Role of Fixed Income in their Portfolios if Yields Should Rise?
- What are you doing to Mitigate Inflation Risk?
- How are you expecting Risk Mitigation Strategies to Perform going forward? Are Long Bonds still the Best Bet or are there Good Alternatives out there?
- What do you think of Applying Leverage to a Plan Sponsor Portfolio to Increase its Expected Return? How do you Manage Leverage Risks?
- What Future Risks are you Most Concerned About? Anything that Keeps You Up at Night?

Sessions

10:15 AM – 10:55 AM

Networking Break

10:55 AM – 11:30 AM

Track A: Cybersecurity Risk

Reducing Threats to LP/GP Organizations

High-profile breaches of security have been grabbing headlines for years as the threat has entered into the multi-trillion dollar stratosphere. What do investors and managers need to hone in on to avoid unnecessary issues and what are the best practices to protect themselves?

- What are the Greatest Cybersecurity Threats and Challenges Organizations are currently facing? Specific Risk Areas?
- Where will Future Cyber Attacks come from? Any Types that Stand Out?
- What are the Critical Components for Developing a Cybersecurity Risk Management Strategy?
- How should you approach Staff Education about Cybersecurity Risk and Best Practices?
- Should the Board Hire a Third Party to Perform an Independent Analysis?
- What Cybersecurity Questions should LPs ask in their Due Diligence of their Investment Managers?
- Should Plan Sponsors have Cybersecurity Insurance Coverage? What is typically Covered in a Policy?

10:55 AM – 11:30 AM

Track B: Real Estate

Refocusing the Portfolio Post-Pandemic

The real estate industry – whether commercial or residential – has undergone a fundamental change in the past two years as the way people view their work environment and home life has been altered. What does the future look like for concerning spaces such as malls and office space and where do the best opportunities lie?

- What is your take on the Most Concerning Sectors – Retail, Mall, and Office Space?
- With Industrial in Short Supply with Increased Demand, should Investors be Overweight Industrial? How Long will this Hot Trend Last?
- What Niche Property Types will be Defensive in a Downturn? Thoughts on Lab Space and Data Centers?
- Are Data Center REITS the New Digital Office? How do you Approach these REITS being Pricey and the Growing Competition in this Space?
- What is your Outlook for the U.S. Commercial Mortgage Market?
- Do you see the Growing Multi-Family Sector as a Good Opportunity? If so, why?
- With Pressure on Banks and Lenders, do you see Opportunities in Private Real Estate Debt to Fill the Funding Void?

Sessions

11:35 AM – 12:10 PM

Track A – China

Developing a Risk/Reward Plan

The ongoing question of where US and China relations stand will be addressed as investors weigh the risk and rewards between the two countries. From there, which investments in China make the most sense looking out a few years and which do not?

(A) U.S. / China Relations

- Have you Seen any Progress for Cooperation when it comes to Geopolitics?
- Do you see Technology Wars Becoming the New Trade Wars? Are A.I. and Cybersecurity are the most Important Issues to Prevent China's Dominance over the U.S. in Technology?
- Might you see a Future Climate War Between Washington and Beijing with China far Outspending the U.S. on Energy Transition-Related Investment? How does Biden's Infrastructure Plan Factor In?
- How do you see it playing out with China possibly Looking to Limit U.S. Access to Rare Earth Minerals which are Critical to Manufacturing many Tech Products? What is the U.S. doing to Reduce Reliance?
- How do you see the No-Win Clash over Taiwan Playing Out?

(B) Investing in China

- Do you Perceive any Serious Risks for U.S. Pension Plans being Invested in China?
- Any Implications of Not being Invested in China? Do you Need China in your Portfolio to Meet Return Targets?
- Are you Expecting Additional Regulatory Changes and Tougher Accounting Standards for Listed Companies in the U.S.?
- Will U.S. Regulators Block Investment Organizations from Buying Shares in Chinese Companies that are Blacklisted by the Pentagon or the U.S. Department of Commerce?
- How are Private Equity Firms Revising their China Strategy with the Regulatory Crackdown? Which Sectors are Most Affected by the Regulatory Scrutiny?
- With the Failure to Bail out Evergrande, does this mean China is Tamping Down on Excesses in the Chinese Economy and Markets or just their Property Markets? What does this mean for Investors?

11:35 AM – 12:10 PM

Track B: Infrastructure

Measuring the Impact of Biden's BBB Package and Why it Matters

The Biden Administration's Infrastructure package has been receiving much of the industry's attention in recent months – and rightfully so. Are there any unforeseen winners and losers as a result of this spending spree? Apart from this, which strategies are set to outperform looking out two to three years?

- Will Biden's Infrastructure Plan create an Infrastructure Boom, be Inconsequential or Add to the Tailwinds that were already there?
- What are the Negatives to Biden's Infrastructure Plan?
- Is Infrastructure a Good Hedge Against Inflation? What Strategies provide the Best Hedge?
- What have been the Effects of High Energy Prices and Supply Chain Disruption on Global Infrastructure Markets?
- What Sectors within Renewables or Alternative Forms of Energy do you find Attractive? Will the Best Opportunities be in the U.S. or Emerging Markets?
- With the Acceleration of Digital Infrastructure, which Specific Strategy Stands Out?
- How have GPs Adopted ESG Principals and what are the Remaining Challenges? How do you Approach ESG as an Energy Investor?
- Listed vs. Unlisted – which do you Favor in a Volatile Market for Downside Protection?

12:10 PM – 1:20 PM

Lunch

Sessions

1:20 PM – 2:00 PM

Risk Mitigating Strategies

Managing Risk within the Portfolio

Creating a risk mitigation portfolio has been a popular discussion as inflation talks linger and volatility becomes more evident. How can investors best implement these strategies and what are the unforeseen risks investors need to watch out for when creating or amending these portfolios?

- Are you Concerned about Inflation or Stagflation? In what Ways are you Mitigating this Risk?
- How do you view Long Duration Treasuries Today as a Mitigation Tool? Might the Protection be Different in the Next Equity Sell-Off?
- Describe your Baseline Risk Mitigation Philosophy and Approach
- How would you Structure a Risk Mitigating Strategies Portfolio? What Strategies should be Emphasized?
- What is the Best Approach to Achieve Diversification and Better Risk Adjusted Performance Across a Wide Range of Markets and Asset Categories?
- Have Trend Following Strategies Evolved to Perform Well Regardless of Market Environment?
- As an LP, what is your Approach to Managing Liquidity Risk should we have a Large Drawdown?
- What is the Appropriate Level of Strategic Exposure to Risk Mitigating Strategies Approaches?

2:00 PM – 2:30 PM

Lead Sponsor

2:30 PM – 3:10 PM

Fixed Income

Positioning your Portfolio in Light of Macro Factors

Fixed income assets that had enjoyed a smooth ride in the early stages of the recovery may face more challenges ahead. Valuations are broadly expensive, the Federal Reserve is withdrawing liquidity and economic growth has significantly declined from high levels. We'll hear about how to position your portfolio beyond the recovery while we factor in credit spreads, rate volatility, ESG and more.

- Assess the Current Macro Environment – Fed Actions, Tapering, Rates, Inflation Risks, etc.
- Is there Built-In Complacency of the Fed Coming to the Rescue?
- With Bond Markets being Better Forecasters of Recessions and Recoveries than Equities, what is the Steepening Yield Curve Telling you?
- How does an Unconstrained Manager Navigate such an Environment?
- Are you seeing any Major Changes in Allocations, Inflows/Outflows or Investor Interest in Specific Types of Products?
- How are you Managing Fixed Income Liquidity Challenges? What are you doing about your Cash Levels?
- What are your Expectations and Outlook for Corporate Debt? BBB Bonds? How are you Approaching this Space?
- How do you Separate Managing Credit from Managing Duration?
- ESG Integration – what should Allocators be Incorporating to make sure they are not getting a Greenwashed Product?

3:10 PM – 3:40 PM

Refreshment Break

Sessions

3:40 PM – 4:20 PM

Equities

Managing Volatility Risk

The US Equity markets are experiencing increased volatility within this rising rate and inflationary environment but is it time to alter the asset allocation size as a result?

- Have we Reached the Peak – at least for now – in the US Equity Bull Run? Is it Time to Lower the Allocation Size? If so, where would you move those Assets? Or do you Believe the Bull Market will Continue for some time? If so, why?
- Have you Allowed the US Portfolio to Run Over its Asset Allocation Range? What kind of Conversations Take Place when Rebalancing Talks Occur?
- How will the Rising Rate Environment Impact US Equities? How much Wind will come out of the Sails?
- What is the Likelihood that the Equity/Bond Correlation will Shift During a Potential Equity Decline?
- Does it Make Since for Public Funds to Lessen their Equity Portfolios and Embrace LDI-like Strategies?
- What are your Views on non-US Equity Markets, most notably Europe and the Emerging Markets? Have Overweight Discussions Taken Place? How about the Frontier Markets?
- How are Traditional Equity Hedges – such as Gold and the US Dollar – Viewed now that Crypto has Entered the Picture?

4:20 PM – 5:00 PM

Hedge Funds

Weighing the Bounce Back of the Hedge Fund Portfolio

Hedge funds have been tested in recent months and years as numerous macro factors have impacted the industry. Has the way hedge funds are used in your portfolio changed as a result and which areas could produce the most returns in this environment?

(A) State of the Industry / Portfolio Construction and Implementation

- How do you use Hedge Funds in your Asset Allocation and how might that Change in the Current Environment?
- Taking into account Both Equity and Bond Valuations, how do you think about using Hedge Funds as both a Hedge to Equity and a Crisis Risk Offset?
- Has the Current Macro Environment Resulted in a Change in your Hedge Fund Portfolio Construction Approach? Any Particular Strategies you're looking to Opportunistically Add or Remove?
- What ESG Approach should Managers be taking in their Funds? How do ESG Considerations Apply to Different Hedge Fund Strategies?
- Is Responsible Investment the "Next" Big Opportunity for Active Managers?
- What is an Appropriate Fee Structure for Hedge Funds? How do you Ensure Payment for Alpha, Alignment of Interest and Not Overpaying for Underperformance?

(B) Strategies

- Which Low Correlated Strategies do you find Most Attractive to Minimize Drawdown?
- Has Recent Poor Performance changed the way you view Quantitative Hedge Funds? Why or why not?
- What is the Future of Long-Short Equity Hedge Funds? What Differentiates Managers that have been able to Outperform?
- Have Trend Following Strategies Evolved to Perform Well Regardless of Market Environment? Do you Favor Global Macro and Managed Futures in this Environment? If so, why?
- What Changes do you believe Fund of Funds need to make in order to Retain or Attract Assets?

Sessions

5:00 PM – 5:40 PM

Private Equity

Understanding Impacts to Private Equity Post-COVID: Looking Ahead and Mapping The Future

The mantra for investing has always been to 'buy low and sell high' and it is no different in the private equity industry except it's becoming harder to understand what a good price is. With that in mind, what spaces currently offer the best opportunities and how have they been impacted by inflation and the rising rate environment?

- When it comes to the Concerns of Supply Chain Shortages, Possible Higher Rates, Dry Powder, Leverage and High Multiples, what should Investors be Focused On over the next few years to Successfully Navigate the Environment?
- How does Inflation affect your Investment Strategy? What Impact might Sustained Inflation have on Returns?
- How are GPs and their Portfolio Companies Dealing with Rising Costs?
- How Concerned are you about the Debt that's been Piled on to Portfolio Companies?
- What Fundraising Trends are you seeing in the Market? Might Sustained Inflation Impact Fundraising Plans?
- What is your Outlook for Middle Market Buyouts given the Market Conditions?
- What Trends are you seeing in Co-Investments – Demand, Types of Deals, Return Expectations, Etc.?

5:40 PM

Cocktail Reception

7:10 PM

Cocktail Reception Concludes

Sessions

Wednesday, April 20th
Westin St. Francis, San Francisco

7:30 AM – 8:40 AM

Investor Exchange / Breakfast / Registration

8:40 AM – 8:45 AM

Day Two Opening Remarks

8:45 AM – 9:25 AM

Diversity, Equity & Inclusion, (DEI)
Implementing DE&I Policies

DE&I has become a top issue for many asset management boards and investors over the past year but where do we stand currently on this and what actions are being taken to achieve stated goals? How are investors looking at DE&I when it comes to making investments?

- With Diversity, Equity & Inclusion coming to the forefront, what is the State of Progress? Where have you seen Changes being Most Successful?
- What is the Statistical Evidence that Diversity leads to Better Performance?
- As an LP, have you chosen to Actively Survey your Managers and Annually Request Data on Firm Ownership and Investment Team Composition? What are some of the Challenges of getting the Data? Do you Express Expectations for Improvement and Progress?
- Where in the Process Between an RFP and a Mandate do Problems Arise in the Push for Diversity?
- What would you say are the Barriers to Greater Diversity and Inclusion? Most Critical Issues is for Improving the Gender Gap? How should we Approach Solving It?
- What do you think Consultants could do more of to Help Bridge the Diversity Gap in Investing?
- What are some Best Practices Investors and Managers need to Embrace in Order to Achieve Diverse Hiring Success? Any Important Considerations for Hiring Junior Talent or ways to Broaden the Recruiting Pipeline?

Sessions

9:25 AM – 10:05 AM

Climate Change

Understanding And Managing The Impact, Risks and Opportunities

Understanding the risks of climate change is an important exercise investors must undertake these days. What are the best ways to conduct this study and what are the opportunities that might arise from this work?

(A) Managing Climate Risk

- What Steps should be taken to Climate Proof your Portfolio-Wide Exposure?
- How is your Climate Approach Reflected in your Asset Allocation? How do you Measure and Monitor Climate Risks in your Portfolio?
- What Resources are Needed to Identify Climate Risks in your Portfolio?
- How do you Report on the Impacts of your Engagement? Will this become More Demanding Going Forward?
- What are the Portfolio Implications of the Decision to Reach Net Zero Emissions by 2050?
- Push for Greater Transparency - what are some Questions you should be asking your Investment Managers about their Climate Risk Assessment during the Investment Process?

(B) Strategies

- Should it be a Fiduciary's Responsibility to Replace Oil and Gas in the Portfolio Despite Strong Profits, Good Recent Performance and Higher Dividends?
- What Investment Initiatives are you Implementing in Public Equities? Any Allocations to Climate Solution-Oriented Public Equity Fundamental Managers? If so, how have they Performed?
- Are Green Bonds Worth the High Fees? Is China, Europe, U.S. or Another Region Most Attractive for this Green Investment?
- How is the Real Estate Industry Managing Risk and Embracing for the Inevitable between Flooding and Climate Hazards?
- With Increasing Water-Related Risks, what will be the Credit Implications and the Impact on Credit Ratings?
- Where do you see the Best Opportunities in Smart Cities, Green Buildings, Decarbonizing Technologies, Electric Vehicles, Water, Renewable Energy, Battery Storage or other Appealing Sectors?

10:05 AM – 10:35 AM

Lead/Headline Sponsor

10:35 AM – 11:15 AM

Networking Break

11:15 AM – 11:50 AM

Track A: Emerging Markets

Executing Post-Covid Strategy in Non-Developed Countries

How have emerging market economies fared over the past year as inflation deepens and the talks of raising rates become louder? Do any traditional asset classes or sub asset classes stand out as solid investment opportunities? How about the private markets?

- Macro Environment and Recent Developments – How might Inflation affect Emerging Markets? Tapering? Rising Interest Rates? Strong Commodity Prices?
- What might be the Long-Term Effects of the Massive Expansion of G10 Central Bank Monetary Policy on Emerging Markets?
- Despite the Macro Overhang, where in EM Equity are you seeing the Best Opportunities for Investors?
- How does the Current Macro Environment affect EM Debt? Where are you seeing the Most Opportunity?
- Where do you Currently see the Biggest Risks when Investing in EM Debt? How do you Approach Mitigating those Risks?
- How Concerned are you about China's Debt Problem? Does Evergrande lead you to believe they are Shifting Away from Supporting Excess Corporate Debt?
- How do Valuations look Relative to Risk in Different Regions? Which Particular Regions, Sectors or Countries are Attractive?
- Do you believe Emerging Markets will Outperform Developed Markets over the Next Decade?

11:15 AM – 11:50 AM

Track B: Risk Parity

The Great Debate: To Embrace Risk Parity (Or Not)

Risk Parity strategies fell on hard times recently with some investors ridding themselves of the investment altogether. Is it time to begin embracing risk parity again, and if so, why and why now?

- How does Risk Parity Perform if the Rate Cycle has now Turned and we have a Period of both Increasing Interest Rates (due to Inflation) and Declining Equity Market Multiples?
- What did we Learn from the March 2020 Selloff for Risk Parity Strategies?
- Is Every Fund Equipped to deal with the Leverage Risk of Risk Parity? How fast should Risk Parity Strategies De-Risk in Market Drawdowns?
- Do you believe Risk Parity can Play a Role in and Contribute to Overall Stock Market Volatility due to the Leverage?
- How are Risk Parity Strategies Evolving? Should Tail Risk Hedging and Smart Beta be Added?
- What do you Recommending using for an Appropriate Benchmark? Which Implementable Indexes are being Adopted?
- How should Investors think about the Differences in Strategies including Forecasting Volatility when Selecting a Manager?

11:55 AM – 12:30 PM

Track A: Energy

Gauging Whether we are in the Early Stages of a Global Energy Crisis

As we enter into a period of higher energy prices, can the blame be put squarely on inflation and supply shortfall? What other factors are making themselves known and when can we expect pricing to normalize?

(A) Energy Crisis

- Current Global Environment – Supply Shortfall, China Rolling Blackouts, Natural Gas Price Spike in Europe and Asia, Electricity Prices, Liquified Natural Gas in China, Coal and India's Dependency on it, etc.
- What are the Far-Reaching Effects of China's Coal Crunch causing a 12% Cut of Industrial Power Use? How Long might Power Cuts Persist?
- Is it Possible the Global Climate Change and Clean Energy Push is a Direct Cause of the Higher Prices we're seeing across the board for Electricity, Oil, Natural Gas and Coal?
- Explain the Governmental and Political Efforts Contributing to Higher Prices from Reducing Energy Production via New Mandates, New Taxes, Cancelled Pipelines, Cancelled Permits and Penalties
- With Declining Production and Increasing Demand, do you see Higher Energy Prices Ahead? If so, what are the Effects on Industries and Companies if it becomes Prohibitively High?

(B) Energy Investments and Solutions

- Despite ESG Efforts, do you believe Bigger Returns Ahead are in Alternative Energy or Fossil Fuel Companies?
- Should a Fiduciary be Replacing Oil and Gas in the Portfolio Despite Higher Profits, Higher Dividends and Outperformance?
- Do you believe the Hopes on Hydrogen as both a Way to Store Energy and as a Fuel for Transportation and Industry will Pay Off? How Far off is this Possible Solution?
- What are your Views on Battery Storage Technology as a Solution and Investment?
- What Sectors within Renewables or Alternative Forms of Energy do you find Attractive? What is the Risk/Return Profile?
- What's the Most Important Risk Factor for Investors thinking about Deploying Capital in Renewables?

Sessions

11:55 AM – 12:30 PM

Track B – Liability Driven Investment (LDI)

Taking a Fresh Look at LDI and Weighing whether it Works for non-Corporate Funds

Liability Driven Investing, when enacted, has largely achieved its goal as funded statuses across the corporate sector have moved closer to fully-funded status. But the market environment is expected to undergo changes in the near future, how does that impact LDI and how can non-corporate pensions best utilize this strategy?

- Does LDI make sense now considering Current and Future Market Conditions? Impact of Rising Rates and Inflation? What is the Risk/Return?
- Are Plan Liabilities the only Appropriate Benchmark?
- How does a Public Fund Implementation and Liability-Focused Allocation Differ from a Corporate Fund?
- Are some Approaches More Appropriate in a Less Liquid Fixed Income World?
- For a Public Fund, what Cash Flow Generating Strategies would allow for the Portfolio to Reduce the Funding Ratio Volatility and Meet the Benefit Payment Needs?
- Understanding the Components of Performance Measurement and Evaluation – Risk Budgeting, Scenario Analysis, Liquidity Analysis and Performance Reporting
- Beyond the Ability to Earn Excess Returns, what should Investors look for in Selecting LDI Managers?
- What are some Common Myths that are Holding Back Plan Sponsors from Implementing a De-Risking or LDI Strategy?

12:30 PM – 1:40 PM

Networking Lunch

1:40 PM – 2:20 PM

Inflation

Analyzing the Ramifications on the Portfolio

It has become clear that inflation is not transitory but likely here for an extended period of time. What needs to be done in order to bring inflation back to normal measures and how will this impact institutional portfolios?

- Has the Fed Backed Themselves into a Corner on Inflation? How likely is Stagflation and how will the Fed React at this Economic Threat?
- How has Inflation Impacted the Overall Portfolio thus far? What are the Unforeseen Risks Looking Ahead?
- What are the Deflationary Factors and when might that Return?
- What are your Views on the Shortages including Power, Food, Housing, Semiconductors and Labor? How Extreme might the Price Surge be for Oil and Energy?
- What are your Views on the Rise in Home and Rental Prices?
- What are your Expectations for Rates and Equities? What will happen to the BBB Rated Bond Bubble? What is the Outlook on Defaults?
- What is the Likelihood that the Equity/Bond Correlation will Shift During an Extended Equity Decline?
- What are the Most Appealing Investments in this Environment? Asset Class where you see the Most Value?

Sessions

2:20 PM – 3:00 PM

Credit Strategies

Analyzing Macro Factors and how that Impacts Credit Portfolio

Interest rate conversations, inflation, and a bevy of other factors have major impacts on the credit markets. Which credit strategies and geographies provide some of the best risk/reward in this environment and which areas do not?

- Current State of the Credit Markets
- What will be the Impact of Inflation, Potentially Higher Rates and Supply-Side Constraints on your Strategies?
- What particular Challenges or Concerns are you seeing Today – Valuations, Deployment, Liquidity, Leverage, Higher Taxes, Increased Regulation, etc?
- What are your Expectations for Credit Spreads and Defaults?
- How will the Distressed Opportunity Set Play Out and how are Investors Positioning their Portfolios?
- What Subsectors of Credit are Most Attractive and why? Pockets of Opportunity you're seeing? Any Areas you are Avoiding?
- What are the Top Opportunities and Risks for Europe, Asia and EM?
- Are you having Discussions with your Clients or Boards about how to Implement ESG and SRI into your Mandates?

3:00 PM – 3:40 PM

Distressed Investing

Taking Stock on Opportunistic and Special Situation Strategies

Investing in distressed opportunities never fully materialized during Covid as government intervention largely kept companies afloat. However, it is expected opportunities in this space will begin to reveal themselves in the near future. What sectors and geographies are being tipped to show themselves in the next year or so?

- Are you Expecting a Large-Scale Distressed Opportunity? Why or why not?
- What are your Expectations for Default Rates going forward? Does it Matter in terms of Current Opportunities?
- What Guidance do you provide Investors on Expected Returns & Risks? How is the Large Supply of Dry Powder and Pent-Up Demand Impacting these Expectations?
- Which Sectors, Strategies and Geographies are providing the Most Attractive Opportunities? Any Areas that should be Avoided or are most Vulnerable?
- Are you Approaching the Market any Differently given the Ongoing Uncertainty for many Smaller Companies? Increased Vulnerability of these Borrowers? Are Bigger Borrowers Better Positioned to Weather Dislocation?
- What are you seeing in Deal Structuring and Covenants Today? What does this mean for Future Distressed Opportunities?
- What are the Opportunities and Risks in Europe? Any Countries, Sectors or Types of Deals that Stand Out? Conditions of the European Banking Sector?

3:40 PM – 4:10 PM

Refreshment Break

Sessions

4:10 PM – 4:50 PM

Crypto and Digital Currencies

Weighing its Potential Role in the Portfolio

While crypto currencies have begun to gain some foothold within institutional portfolios it is still being debated what the proper role of these investments should be. Should they be used as a hedge or are they return seeking?

- Should Crypto Investing be used as a Hedge? What is its Goal in the Portfolio and what are the Return Expectations?
- Is it Simply Time before Crypto is Fully Embraced by the Institutional Community? What is Holding it back? Does Headline Risk Play a Role?
- What are the Conversations Occurring at the Board Level? What are the Main Fears?
- What would be the Impact on Crypto upon a Digital Dollar Rollout?
- How do Predictions of a Weakening Dollar Play a Role with Crypto?
- How will Inflation Impact Crypto Looking Out One to Two Years?
- What Kind of Benchmark is Appropriate for Crypto Investments?

4:50 PM – 5:30 PM

CIO Roundtable

Inside the Minds of CIOs

- Have the Risks of Inflation caused your Asset Allocations to Change? What are you doing to Hedge Against Inflation? Have you Increased your Allocation to Private Assets? If so, what was the Reasoning Behind It?
- What Process or Policies do you have in place to Address DE&I and Climate Change?
- Have you Increased In-House Investment Management Capabilities?
- What do you think about the Fiscal Health of the Industry going forward?
- Did the COVID Selloff Change your View on Passive as a Result of Market Volatility? Any Allocations in Particular where Active Managers are Better Equipped to be more Agile and Flexible?
- What Changes or Trends have you noticed in Fee Structures/Terms and your Bargaining Power?
- What Advice might you have for Smaller Pensions and Endowments that don't have your Size Leverage in trying to get Better Terms?
- Is there any Part of the Market that is "Unloved" right now and might be Worth some Further Analysis/Portfolio Allocations?
- What Keeps you up at Night?

Sessions

5:30 PM

Conference Concludes / Tickets for Networking Event handed out in Conference Room

5:40 PM

Networking Event

Wine Tasting and Dinner

Hosted by With Intelligence – Join our group at for a wine tasting and dinner at the Press Club, located just a few blocks from Westin St. Francis. Meet your industry peers in great setting as California Wine Country comes to the heart of the city. Experience the finest winemakers with new and rare vintages. We'll have a fun wine tasting reception, followed by a tasteful dinner with the highest quality organic ingredients. With Intelligence will utilize the 9000 square feet of the award winning "Best Restaurant Design" event space for networking for our high-quality conference group.

To Register Or Receive More Information About With's 2022 Pension Bridge Annual Conference

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About With

Founded in 1998, With Intelligence is an independent, entrepreneurial and fast-growing company serving more than 2,500 clients across the asset management industry worldwide. Through its highly acclaimed, specialized platforms and world class events offerings, With Intelligence equips its clients with a unique combination of must-have intelligence and proprietary real-time data, while offering them exclusive access to key decision-makers form the world's preeminent investment organizations and their consultants.

SAN JOAQUIN COUNTY EMPLOYEES' RETIREMENT ASSOCIATION

SUMMARY OF PENDING TRUSTEE AND EXECUTIVE STAFF TRAVEL

2022 Event Dates	Sponsor / Event Description	Location	Traveler(s)	Estimated Cost	BOR Approval Date
Mar 5 - 8	CALAPRS General Assembly	San Diego, CA	McKelvey, Shick	$4,000	N/A
Apr 18 - 20	Pension Bridge Annual Conference	San Francisco, CA	McCray	$1,750	pending

San Joaquin County Employees' Retirement Association

December 30, 2021

TO: Board of Retirement

FROM: Paris Ba
Retirement Investment Officer

SUBJECT: Pension Bridge Alternatives Conference

Thank you for the opportunity to attend the virtual Pension Bridge Alternatives Conference on November 1-3, 2021. The topics covered are summarized below.

Systematic Macro and Alternative Risk Premia

The equity market has decoupled from earnings, as the market has increased ahead of very high earnings expectations. According to GAM Investments, there are a few options for investors: 1) Long/Short Equity strategy, 2) Systematic Macro and Trend following strategy, and 3) Long Volatility strategy, with Long Volatility being the most expensive yet likely the most effective solution if we were to have a prolonged bear market.

Role of Hedge Fund in the Portfolio

The hedge fund space has always been an evolving asset - the most recent trends are Quant Strategy underperforming the market. There has also been an increase in fees in hedge funds over the last decade, and sometimes the fees are not justified by alpha. The advice from the panelists is to invest in the fund early or make a big allocation to the fund to get a discount.

Long/Short Equity Strategy

The goal of Long/Short Equity Strategy is to have a more balanced return in the Equity Market. One panelist expects the first half of this year to have much higher volatility than last year, so he thinks the Long/Short Equity Strategy will perform well in that market environment. Biotechnology/Pharmaceutical firms seem to be the favorites for the group. Given the results of pharmaceutical products tend to be binary, a Long/Short Strategy will likely reduce total risk exposure within the Equity strategy.

Environmental, Social and Governance (ESG)

ESG is no longer a secondary consideration for a lot of investors, it is considered a bundle when investors look at future investments. The three largest dominant considerations for the group are Utility, Auto (EV), and Aviation.

Cryptocurrency

With Central Banks printing over $20 trillion money last year, the value of fiat money has diminished in real terms. Cryptocurrency, particularly Bitcoin, has a limited terminal supply (there can only be 21 million coins mined ever), which makes the "free money printing" option virtually impossible. Given Cryptocurrency is a highly volatile asset, participants said the typical sizing for Cryptocurrency is similar to a Venture Capital investment sizing, which is between 1%-3% of the portfolio (and a 5% hard cap).

Global Macro

The Global Macro strategy has to be adaptive to the market conditions, i.e. the 2008/2009 drawdown lasted over a year, whereas the COVID drawdown was very fast, so it is important to calibrate your model to adjust to different market conditions.

Secondary Market

The Private Equity secondary market is on an upward trajectory over the next few years encompassing buyouts, credit, growth, real assets and venture capital strategies. Despite COVID slowing the market in 2020, it was still the second busiest year for secondaries, with volume of over $70 billion. Whitehorse Liquidity Partners expects the market will reach $100 billion for the first time this year.

Private Credit

Risk premium in Private Credit is as low as it has been in a long time. And the Private Credit market managers are competing heavily with banks, who are not afraid to underwrite private loans in the current market environment, which in turn drives the risk premium even lower. The key is to identify any niche areas that are not as crowded, and be selective.

Distressed Investing

There is a lot of capital chasing the distressed market, but there are still opportunities; it's just not as easy as during the GFC in 2008/2009. Sourcing is very important, whether you are going for High Yield opportunities, US bank loans, or even a refinery in Brazil,

investors need to broaden their market opportunity sets. Managing through the Fed's expected hiking cycle is also very important, as distressed investing is highly cyclical, and any volatility in the market will likely have a big impact on the segment.

Co-Investments

The key to participate in co-investments is to have a set of procedures to follow, i.e. setting criteria to evaluate investments on a deal by deal basis. You also need the right resources/team to do co-investments with other LPs. While a handful of LPs have expressed interest in co-investments, in reality, a lot of the LPs are not able to move fast enough to participate in the deal.

Private Equity

Private Equity has had a robust outperformance over Public Equity over time and across sectors. Canada Pension Plan Investment Board (CPPIB) is one of the world's biggest pension plan with over $500 billions of AUM, and they are targeting a 20% allocation to Private Equity. CPPIB Private Equity Director is also surprised that Venture Capital has become such a large-scale sub-segment within Private Equity.

Post-Pandemic Asset Allocation Strategy

Justin Sheehan from the World Gold Council was the presenter for this session. He was pitching for an allocation for gold, as gold does a good job tracking the broad inflation index over time. Gold has also outperformed other commodities in a stagflationary environment. When asked about Bitcoin being the new "digital gold," his reaction was that Bitcoin did not have a long history as gold, and its volatility does not make it a good safe-haven asset.

Real Estate

The cap rate in the Real Estate market has been decreasing over the years, and participants agree that the best way to invest is to find areas that institutional money has not flown into, where there are still opportunities for slightly higher returns.

Inflation

Warwick Investment Group stated their best inflation hedging ideas are Upstream energy, residential real estate, and liquid/illiquid Cryptocurrency (Bitcoin, Ethereum and Non-Fungible-Token). Waterfall Asset Management's best idea is also real estate, though he is worried about the Industrial real estate sector, as a lot of the E-Commerce companies

(such as Amazon) tend to lock in a 10-year lease, and as inflation goes up, that would not be an ideal situation to be in if you are on the other side of the trade.

Energy

Natural gas dominated the discussion, as there is a natural gas shortage and the price has spiked. There is also a lot of demand for energy transition and renewable energy, but it would be very difficult to have your energy source to be 100% renewable energy.

Infrastructure

The potential increase in Fed Fund Rate will likely have a negative impact on Infrastructure, as this sector tends to move in a similar fashion as the Equity market. The more Opportunitic segment of Infrastructure will see a bigger negative impact than the Core segment. The current Biden Infrastrucutre plan has certain biases, such as an emphasis towards airports/ports over roads, and also a heavy emphasis on renewable energy.

San Joaquin County Employees' Retirement Association

January 14, 2022

TO: Board of Retirement

FROM: Johanna Shick
Chief Executive Officer

SUBJECT: Chief Executive Officer Report

Happy New Year! Last year was a busy and productive year, and as I look ahead into 2022, I see more of the same: more opportunities for making SJCERA even better. Submitted with this report, you will find a summary of SJCERA's accomplishments on our 2021 Action Plan goals and a revised 2022 Action Plan. The revised 2022 Action Plan, which was submitted in October in accordance with policy, aligns the action plan's goals with the format, structure and content of the 2022-2026 Strategic Plan the Board reviewed in December.

Welcome Aboard Incoming Assistant CEO Brian McKelvey!

As you know, Assistant Chief Executive Officer (ACEO), Kathy Herman, is retiring in first quarter 2022. While filling Kathy's shoes is not an easy task, I am pleased to announce incoming ACEO, Brian McKelvey, is up to the task!

The Board will have an opportunity to meet Brian, who joined SJCERA on January 10, at the January Board meeting. He brings more than 20 years of experience in state and local public pension administration, including extensive experience with the San Diego County Employees Retirement Association (SDCERA) and implementation of multiple pension administration systems (a project SJCERA will be working on over the next three to five years). We are delighted to have him join our team.

Strengthen Fund Stability

Assets Under Management (AUM) Reach New Heights (Again). The Flash Report, which provides investment return details as of November 30, 2021, confirms SJCERA's assets grew 10 percent net year-to-date, bringing our AUM to a new all-time high of $3.93 billion.

Neuberger Berman High Income Fund's Personnel Change. Two of Neuberger Berman's portfolio managers, Russ Covode and Dan Doyle, will be retiring June 30, 2022. Joseph Lind and Christopher Kocinski, who have shared portfolio management responsibilities with Russ and Dan in the past, will continue as co-portfolio managers going forward.

3% Maximum COLA Remains in Effect for All Members. As reported verbally at the December Board meeting, upon subsequent legal review, the Mosquito and Vector Control District (MVCD) has determined there is a requirement to meet and confer prior to adoption or implementation of a 2 percent COLA for Tier 2b members. As such, at this time, the existing 3 percent COLA remains in effect for MVCD members (as well as all other SJCERA members.) At their request, SJCERA is formally documenting this in our minutes of the December 2021 Board meeting and in this CEO report. If there are any future developments related to this topic, I will keep the Board apprised.

Manage Risk

Conduct Cybersecurity Audit. The cybersecurity audit presentation, provided to the Audit Committee in closed session on December 3, is included in the full Board's January closed session materials. Adnan

Khan and Lolo Garza have already taken several steps to further strengthen SJCERA's cybersecurity posture.

Deliver Excellent Service and Support to Stakeholders

Provide Excellent Customer Service. In 2021, 96 percent of members completing the customer service survey reported they were satisfied with the service they received from SJCERA. Reasons for requesting service continues to be dominated by service retirement related items (counseling, inquiries, estimates) at 28.4 percent of inquiries, and Retiree Payroll changes (insurance and deduction information) at 25.44 percent of inquiries.

Medicare Part B Reimbursement. Mary Chris Johnson and Kathleen Goodwin are busily processing the Medicare Part B Reimbursement forms to ensure eligible retirees receive the correct reimbursement. These forms and corroborating documentation from Social Security are required annually from approximately 900 retirees with the sick leave bank. All documentation was due by January 3, 2022 for reimbursement in the February 1 payment.

Deliver Operations Timely and Accurately.

Interest Posted Timely. In compliance with Government Code Section 31591, SJCERA credits interest semiannually on June 30 and December 31 to all contributions in the retirement fund that have been on deposit for six months immediately prior to such date. SJCERA's *Reserve* policy requires semiannual interest be credited to the Member Reserve before any other reserve using the rate which, when compounded, produces the annual actuarial assumed rate of investment return. The current assumed rate of return is 7 percent, and the semiannual rate is 3.4408 percent.

IRS Form 1099-R. Now that interest is posted, is focused on producing the 1099-R forms, which will be mailed by January 31, as required.

Maintain a High-Performing Workforce

Staffing Updates.

Retirements. A hearty congratulations to Mary Chris Johnson on her upcoming retirement! On Monday, January 4, she announced she will be retiring on or before April 1 of this year. Mary Chris has spent more than 33 years providing gracious and considerate public service to SJCERA's members and County residents. Mary Chris joined SJCERA in 2006 and is well known to our retirees as the friendly, helpful, reliable voice on the other end the phone. Mary Chris, known to her friends as "Chris" enjoys softball, and spending time with her family. Mary Chris is also a member of the Stockton Hall of Fame. She'll be missed, but we wish her all the best in her well-deserved retirement.

Recruitments.

Interviews to fill two Retirement Technician positions were held on January 12. Preparing for the new system implementation and training someone to replace Retirement Technician Mary Chris when she retires are top priorities.

Modify SJCERA Job Descriptions for Career Paths to Meet Organizational Needs. Assistant Chief Executive Officer, Kathy Herman with assistance from the County HR, updated job descriptions and minimum qualifications of four positions. The revised descriptions better reflect current duties, provide opportunity for cross training and back-ups, align career paths and also strengthen SJCERA's overall continuity of operations. The Civil Service Commission is reviewing the updated job descriptions at their January 18 meeting and their approval will complete our work on this project.

Implement Approved Changes to Physical Layout of the Office. We have ordered two cubicle spaces in anticipation of staffing up for the Pension Administration System (PAS) project. To make room for the cubicles, Management Analyst Greg Frank submitted a disposal request form to County Purchasing for

our surplus filing cabinets.

Year End Celebration. As COVID-19 restrictions lifted in early December, we were able to enjoy each other's company in person at our Year End Celebration. Staff contributed to a catered lunch, the traditional white elephant gift exchange resumed and we participated in a few ice breaker games to get to know each other a little better. It was a great day celebrating our successes and each other.

Managing Emerging Organizational Needs

Assess Need to Issue RFPs for example for Various Vendors/Services.
In response to our Investment Counsel RFP, the Evaluation Team (Paris, Greg, Jason, and Johanna) will be conducting interviews for the top three finalists on January 26. The plan is to have a fully executed contract by end of February.

Identify and Begin Implementing a 2022 Strategic Planning Process. Included in the January Board materials is the final 2022-2026 Strategic Plan, which includes the changes requested by the Board in the December Board meeting.

Tier 2b Implementation. The first payroll file with Tier 2b members will arrive January 20. IT has worked with both the County and the Court to ensure they understand the requirements so the data can be imported correctly.

Alameda Implementation. SJCERA issued deferred members *Alameda* repayment of contributions and interest on December 5 and 15. Staff has completed a final review of the population and identified there are fewer 70 additional calculations to be performed. Staff's expertise is required to research and calculate the accounts for these final members.

Annual Trustee Education Report. Government Code Section 31522.8 requires Board members to complete 24-hours of education every two years. The 2021 Annual Board Education Compliance Report is included in January meeting materials for your approval and will be posted to SJCERA's website. All Trustees, whose two-year period ended December 31, 2021, are in compliance.

New Building Ownership Yielding Positive Results. We are already seeing positive changes as a result of the County's purchase of our building. For the first time in five years, my office has been a comfortable temperature—no additional heating or cooling device required! Additionally, County Facilities' response time in addressing office needs has been exceptional, exceeding our expectations.

Form 700s. SJCERA's Conflict of Interest Code Policy requires Trustees to file an annual statement of economic interests (Form 700). The form and instructions were emailed to you earlier this week. Please provide your completed Form 700 to Management Analyst III Greg Frank by **March 23, 2022**.

Conclusion

At the beginning of 2021, we hoped COVID-19 would fade and life would go back to "normal"; however, the COVID variants have required us to remain vigilant to safety and adaptable to the many changing regulations and needs, while still fulfilling our mission and achieving our goals. I couldn't be prouder of staff's efforts. SJCERA's success is truly impressive (especially so in light of the many challenges!) Credit goes to staff for their diligence and the Board for their guidance. (And now we're focused on 2022!)

2021 Action Plan Results

San Joaquin County Employees' Retirement Association

1. Strengthen Fund Sustainability

a. Deliver target investment return

i. Performance.

SJCERA's total portfolio gained 10 percent year-to-date as of November 30, 2021 (the most recently available report), well over our assumed rate of 7 percent. The portfolio has outperformed the benchmark over the latest YTD and one-year periods and slightly trailed over the last three- and five-year periods. Preliminary December 31 numbers indicate the fund will likely exceed 11 percent and assets may cross the $4 billion mark. Additionally, SJCERA continued to make progress in lowering investment management fees: 2020 fees were 50 basis points (bps) compared to 59 bps the previous year. For the period of 2015-2020, investment fees have decreased from 79 bps, resulting in a savings of approximately $10.6 million. With this year's investment results (barring negative actuarial experience) our funded ratio should continue its upward progress.

In 2021, we took several steps to address the portfolio performance including:

- Restructuring the Principal Protection class to address volatility and reduce costs
- Eliminating the value bias within the portfolio
- Reviewing and modifying the portfolio benchmarks
- Considering hiring and/or funding new Private Equity managers
- Re-evaluating the Fixed Income space, including terminating two managers and discussing ways to move forward
- Assessing the impact of inflation on SJCERA's assets and identifying potential ways to protect the portfolio
- Evaluating Core and Non-Core Real Estate investments and affirming the pacing study for future allocations

ii. Board Education Sessions.

Numerous Board Education Sessions have been provided to assist the Board in making informed investment decisions.

- Market Perspectives: Tim Rudderow of Mt. Lucas Management Company
- Active Versus Passive Investing in the Equity and Fixed Income Market Segments: Meketa Investment Group
- Blockchain Technology: Meketa (June), Mark Yusko of Morgan Creek (July), and Kinjal Shah of Blockchain Capital (December).
- Investing after COVID: Investment Roundtable
- Private Assets—What's Next and Where are the Markets Today?: Investment Roundtable
- Inflation—What Can SJCERA do to Protect Its Portfolio?: Investment Roundtable
- Interest Rates and Global Growth: Investment Roundtable
- Trustee Orientation: Staff provided comprehensive overview training to two new trustees.
- White papers and Articles on key topics: active versus passive investing; blockchain; How Investors Can Reach Their 7% Return Target; What You Should Ask Your Actuary; Don't Put the Cart Before the Horse; Did I Miss the Value Turn?; and Pensions Weigh Risks and Opportunities of Chinese Investment

b. Actuarial Funding

SJCERA's funded ratio increased to 68.1 percent on a Market Value of Assets (MVA) basis (up from 64.7 percent last year). This is SJCERA's highest funded ratio since 2007, when we were 95 percent funded. The actuarially determined employer contribution rate increased to 50.51 percent of payroll as we continue to phase in the decreased discount rate. The contribution rate and funded ratio changes were almost exactly what was projected last year.

c. Additional Employer Contributions

Currently, three employers (the County, San Joaquin County Superior Court, and the Mosquito and Vector Control District (MCVD)) voluntarily make additional contributions with the goal of decreasing their portion of the unfunded actuarial liability (UAL). The County continued to make its ongoing, biweekly, additional contributions of about five percent of payroll and, on top of that, contributed an additional $50.6 million. The $50.6 million is approximately double the annual amount the County has been making in extra contribution payments. The Court made an additional payment of $975,000 representing nearly 11 percent of the Court's 2020 annual contributions (the equivalent of almost three additional bi-weekly contributions) and is more than twice the amount of last year's additional contribution of $475,000. The MVCD made an additional payment of $90,000 toward their unfunded liability (UAL). The $90,000 represents nearly eight percent of MVCD's 2020 required contributions (the equivalent of two additional bi-weekly contributions).

d. Other

In addition to the above, the following actions were also intended to contribute positively to SJCERA's fund stability and/or investment returns.

- Reviewed and approved favorable provisions of Most Favored Nation side letters for Prologis and Berkeley Partners
- Received final distributions from Colony Realty III and IV, reducing the number of real estate funds by two from 14 to 12
- Conducted Fixed Income manager search
- Reviewed and approved the extension of the White Oak Yield Spectrum Fund V closing date by three months
- Approved amendments proposed in RREEF II Proxy Vote
- Consented to Stone Harbor's structural changes resulting from the Virtus acquisition, in anticipation of administrative advantages

2. Leverage technology to improve accuracy and efficiency

a. Implement Year 1 of five-year technology plan

i. <u>Implement enhancements remaining on the Statement of Work for Legacy Pension Administration System (PAS).</u>

The following is a list of enhancements implemented this year:

- Refunds – enabled direct deposit and eliminated duplicate data entry for both deferred member's refunds and active/deferred member death processes.
- Records Management for Employer to Employer moves (e.g., Courts to County moves) – improved the Active Member System records and contributions register merge process
- Improvements to the interest posting process
- Improvements to the data extraction process for the actuarial valuation, auditor file, and annual member statements
- Improvements to the member statement process

- Improvements to the service purchase contracts and payoff functionality processes

ii. Identify and contract with a vendor to write an RFP for a new PAS project.
SJCERA issued an RFP for a vendor to write the RFP for a new PAS, with the option of using the vendor for project management services. SJCERA awarded Linea Solutions the contract. The initial requirements sessions have been completed, resulting in approximately 24 separate requirements documents. The documented requirements will be used in writing the RFPs. The PAS and the Data Integrity and Conversion RFPs are scheduled to be released in January 2022 with completed contract negotiations by end of March 2022.

iii. Contract with an outside vendor to conduct a comprehensive Cyber Security Audit
See 3.a below.

iv. Improve website architecture and functionality
See 4.d below.

v. Update/revise outdated system-generated forms and letters
Forms are being updated in the legacy system when processes are updated or a need is identified. The design and implementation of the PAS will include a full review of forms and documents.

vi. Initiate planning and design of Optix work flow to support legacy PAS
This action item was put on hold due to potential compatibility and/or integration issues with both the existing and new PAS system.

vii. Maintain and update core functionality of legacy PAS
Implemented enhanced monitoring protocols to ensure critical functions run smoothly in the absence of vendor support. Also see 2.a.i above.

viii. Research tools to enhance and monitor telework
This action item has been deferred pending SJCERA's upgrade to a Windows environment, scheduled in 2022.

3. Manage Risk

a. Conduct Cybersecurity Audit

SJCERA awarded Linea Secure the Cybersecurity Audit contract following a competitive search. The services included risk assessment, audit, penetration testing, vulnerability assessment, and a red team exercise. The audit report was generally positive and was presented to the Audit Committee in closed session on December 3. Information will be provided to the full Board in January 2022. The IT team has taken several steps to further strengthen SJCERA's cybersecurity posture and will be conducting additional cybersecurity testing in 2022.

b. Conduct Actuarial Audit

SJCERA awarded Milliman the Actuarial Audit contract following a competitive search. Milliman issued a favorable audit review of SJCERA's January 1, 2021 actuarial valuation and confirmed Cheiron used reasonable assumptions and methods. Milliman presented the full report at the September Board meeting.

c. Implement *Alameda* Decision

As a result of the *Alameda* decision, SJCERA is returning member contributions and interest on stand-by pay, correctional briefing pay, and employer contributions to deferred

compensation for affected time periods to approximately 1,350 people. As of the close of 2021, fewer than 70 people are owed repayments.

d. Implement retirement-eligible compensation controls for both incoming contributions and retirement calculations

Staff formalized a final compensation review procedure to support the Board's Final Average Compensation policy. The steps outlined in the procedure have also been incorporated in the requirements documented in the new pension administration system (PAS) RFP. The design and implementation of the PAS will include best practice compensation controls.

e. Assess Disaster Recovery procedures and identify opportunities for improvement

Staff held multiple meetings assessing the disaster recovery procedures, identified opportunities for improvement, and documented disaster procedures necessary to run or reinstate critical business processes in the event of a catastrophic failure. For example, staff developed and tested procedures for generating retiree payroll in the event of a system failure. The actions from those meetings have been implemented as follows:

- Added the Disaster Recovery Plan to the Continuity of Operations Plan (COOP) in the Executive Summary and as Attachment #5
- Updated the following documents in Attachment #3 of the COOP: Board Emergency Contacts, Employer and Labor Representative Contact Lists, SJCERA's Emergency List, and the Third-Party Suppliers
- Added "Update COOP Plan" to SJCERA's Annual Work Plan Schedule document
- Obtained a fully executed EDI Disaster Recovery Agreement with Northern Trust and developed procedures with Auditor Controller's Office for making payments for new retirees who were not part of the prior-month's payroll

f. Research Enterprise-Wide Risk Management (EWRM) methodologies

After conducting initial research into EWRM methodologies and vendors, staff selected an EWRM webinar training provider and presented the webinar to the Leadership team in September. Following the training, the Leadership team determined that further risk management efforts should build upon the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis conducted as part of the strategic planning process. The strategic plan (including SWOT analysis) was presented to the Board in December. In 2022, staff will solicit proposals from vendors to guide SJCERA through the EWRM process.

g. Additional Risk-Management Activities

In addition to the risk-mitigation goals identified in the Action Plan, staff further mitigated risks through the following activities:

Compliance Activities. Staff ensured compliance with the following:

- *Declining Employer Payroll Policy:* Submitted the required annual report timely; determined no triggering events.
- *Generally Accepted Accounting Principles in the US:* Obtained an unmodified opinion (the highest possible) from SJCERA's independent auditor. This is particularly impressive given that two-thirds of our Finance team retired between October 2020 and March 2021.
- *Board Education* policy compliance
- *Conflict of Interest* compliance

Managing COVID-related risks. Staff also managed the risks related to COVID by:

- Continuing and refining our remote working program
- Installing a permanent, professionally designed sneeze shield in the lobby

- Implementing a virtual receptionist
- Implementing hybrid Board meeting capability allowing for both remote and in-person participation
- Staying abreast of, communicating, and implementing County guidance on COVID protocols.

Managing Election risks. Staff proposed and the Board adopted a resolution amending the Registrar of Voters' Candidate Statement of Qualifications for the Board of Retirement Elections to clarify the appropriate content allowed in candidate statements.

4. Improve Operational Efficiency

a. Include disability application processing time performance standard measurements in quarterly performance report

The Disability Application Processing Time is now included on the Quarterly Report. Per the 2021 Third Quarter Disability report:

- **Goal #1 – 100% of applications that do not require a hearing will go to the Board within 9 months**
  Of the nine cases that have been resolved in 2021, four were completed without a hearing and three of those four were completed in less than nine months, a 75 percent success rate.

- **Goal #2 – 80% of applications requiring a hearing will go to the Board within 18 months**
  Five cases required hearings, two were completed within the goal of 18 months, a 40 percent success rate. Delays and/or extensions caused by the applicants, SJCERA's change in policy, change in fund counsel and COVID concerns attributed to the extended processing time of these applications. Wherever SJCERA has control, these issues have been addressed.

b. Research providing retiree earnings statements electronically

The print vendor for earnings statements and checks is capable of issuing electronic earnings statements; however, Northern Trust (which processes the payroll, and sends the appropriate data to the print vendor), does not currently have this capability. Northern Trust reported they are considering implementing it at some point in the future. Staff will continue to stay in contact with Northern Trust on this issue so we can develop an implementation plan if/when they have the capability to support it.

c. Reduce complexity

i. Identify SJCERA-unique processes and opportunities to align with industry norms
Work on this goal will be done in conjunction with the design and implementation of the PAS. During the current in-depth reviews of processes as part of the PAS project, we have identified those that can be improved and modified to fit industry norms.

d. Improve website architecture and functionality

Staff researched vendors and awarded Rolling Orange the contract for website modifications. Accomplishments include:

- Agreement on scope of work description
- Timeline of deliverables
- Website content inventory, and
- Proposed site map

e. Additional Efficiency Efforts

In addition to the efficiency efforts specifically mentioned in the Action Plan, staff further improved efficiency with the following efforts:

- Recommended the Board establish an ad hoc committee to identify required investment manager contract elements. Successfully worked with the committee and counsel to identify those elements with the goal of streamlining the investment manager vetting and contracting process, and containing legal fees. Having implemented this process in late 2021, in the spirit of continuous improvement, staff is bringing these elements back to the Board for refinement in January 2022.

5. Deliver Excellent Service and Support to Stakeholders

a. Provide stakeholder communication and education

i. Revise and update prioritized member communications and web content.

Updates to the website include:

- Revamping the Seminar page to allow members to register for any seminar scheduled during the year.
- Updating the Board of Retirement page to provide a more comprehensive description of composition and responsibilities, and adding evergreen information about the election process.
- Regularly updating the *Alameda* Decision information including adding an Implementation Status document, to keep members informed on SJCERA's progress implementing the court's decision and posting current information on the *What's New* page.
- Providing updated retiree return to work rule information to employers, labor and retiree representatives, County Department Heads, and the leads for the County payroll and personnel user groups.
- Added a Cost of Living Adjustment (COLA) page to the Retired Members section of the website, which explains both the COLA and the COLA Bank.
- Sent seven email blasts to all active members on pertinent retirement topics including Marketing the retirement planning seminars and providing enrollment procedures; Board Election Notices; Using the Retirement Benefit Calculators for SJCERA, Social Security and Deferred Compensation; Key Facts from SJCERA's CAFR and PAFR; and SJCERA's Retirement Calculator Tutorial.

ii. Develop quality online videos.

SJCERA posted its first website video, *Retirement Benefit Calculator Tutorial*, on the Calculator page of SJCERA.org. In addition, staff began sourcing content for videos on specific individual topics by transcribing the *Understanding Your Retirement* seminar.

iii. Additional Member Communications.

In addition to the Member Communications identified in the Action Plan listed above, staff also provided the following:

- *Continued online retirement planning education.* Members continue to rave about SJCERA's webinars: Understanding Your Retirement Benefits and About to Retire. SJCERA shattered previous attendance records: reaching more than 2,500 members through these virtual training events. In total, SJCERA served approximately 1,000 members through SJCERA's virtual seminars and about 1,500 through the County-sponsored New Employee Orientation.
- Initiated Outreach to Centurions. Staff initiated a recognition program for members turning 100, including a certificate of recognition, sent with a birthday card signed by all staff.

iv. Employer Communications.

Met with and/or reached out to SJCERA employers:

- Staff continued partnering with the County on its Cybersecurity Governance issues to improve information sharing, and create the opportunity to implement mutually beneficial solutions. Staff presented SJCERA's cybersecurity efforts at the County's quarterly IT meeting.
- The CEO Reached out to each employer to offer to meet and inquire how SJCERA can better serve them.
- Met with the Mosquito and Vector Control District (MVCD) Manager and gave a presentation to the MVCD Board, regarding the impact of their additional contributions on funding progress and the possibility of adopting a 2 percent maximum COLA for Tier 2b members.
- Worked with the Stockton Metropolitan Airport Director and determined their new Airport Security Coordinator is properly classified as a General position.
- Solicited feedback from all employers during strategic planning process.
- Sent 10 email announcements to employers in addition to the monthly emails informing them of the Board of Retirement meetings and agenda topics. Topics of the additional email announcements included: *Alameda* decision and earning codes discussions; Highlights of Board agenda topics that would be of particular importance for employers; Summaries of new *Employer Notice* content with links to the notices; Retirement contributions rates; Annual compensation limits.

Provided Employers Additional Written Resources

- Created an *Employer Forms* page within the Employer section of SJCERA's web site.
- Wrote and posted the three new *Employer Notices: Retiree Return to Work: Restrictions Reinstated* (informed employers the rules upon expiration of various provisions in the Governor's Executive Order); *Base Pay for New Tier 2 Members* (educates employers about Tier 2b); *Terminal Illness or Death* (how employers can preserve members' families rights to benefits).
- Added *Return to Work and Bona Fide Separation from Service* policy to the Employer Policies page of the web site.

b. Deliver Operations Timely and Accurately

Actuarial Valuation. In preparation for the annual Actuarial Valuation, staff prepared the actuarial data files using the enhanced system for the first time. The data pull was easier and faster than previous years and staff worked with the vendor to further refine the process so it will be even better in the future. These changes also affect the data production process to produce files for the audit and Annual Member Statements.

Interest Crediting. Staff completed the June 30 interest posting on July 12—the earliest in recent history. (Interest didn't post until August in 2019 and October in 2018). SJCERA's *Reserve* policy requires semiannual interest be credited to the Member Reserve before any other reserve. The enhancements to the Core 37 system and the diligence of staff substantially improved the process.

Annual Financial Reports Completed and Submitted. Staff completed the 2020 Comprehensive Annual Financial Report and the 2020 Popular Annual Financial Report. The comprehensive report was submitted to the State Controller's Office as required, and both reports were posted to our website and submitted timely for their respective Government Finance Officer Association (GFOA) awards.

Popular Annual Financial Report (PAFR). The Popular Annual Financial Report was mailed on August 27, 2021 to active and deferred members and in September to retirees.

Member Statements. Statements were delivered to the printer on August 23, 2021, after having passed the quality control check performed by Member Services staff, and delivered to Active and Deferred members shortly thereafter.

New Retirement Benefits and Estimates. In 2020, SJCERA calculated new retirement benefits for 251 active and deferred members, compared to 331 in 2021.

In 2020, SJCERA received approximately 600 requests for estimates and service purchase calculations, compared to 708 in 2021. Most included multiple dates and pay periods to be researched and calculated. Most requests were completed within two weeks of receipt, and all were completed within the published time frame of three to six weeks.

Retiree Payroll. Worked with members to resolve direct deposit issues resulting from the acquisition of Banco Bilbao Vizcaya Argentaria (BBVA) USA by the PNC Financial Services Group, Inc. Proactively reached out to Financial Center Credit Union (FCCU) to inquire if the merger between FCCU and Valley Strong Credit Union could result in similar issues. More will be known in early 2022.

c. Provide Excellent Customer Service

SJCERA continues to receive very positive customer service satisfaction ratings. In 2021, 96 percent of members completing the customer service survey reported they were satisfied with the service they received from SJCERA. Reasons for requesting service continues to be dominated by service retirement related items (counseling, inquiries, estimates) at 28.4 percent of inquiries, and Retiree Payroll changes (insurance and deduction information) at 25.44 percent of inquiries.

Staff installed a virtual receptionist feature, and a Ring camera in the lobby so staff can see visitors in the lobby who may need assistance using the video phone. The Benefits team has the Ring application on their workstations and alerts staff when motion is detected in the lobby, which allows them to offer assistance as needed.

6. Maintain a High-Performing Workforce

a. Modify SJCERA job descriptions for career paths to meet organizational needs

Updated job descriptions and minimum qualifications of four positions. The revised descriptions better reflect current duties, provide opportunity for cross training and back-ups, align career paths and also strengthen SJCERA's overall continuity of operations. The Civil Service is reviewing the updated job descriptions at their January 18 meeting; their approval will finalize this action item.

Moved retiree payroll staff to the Finance team to increase accounting oversite, build additional layers of backup, level set supervisory loads and enhance career opportunities for staff.

b. Implement approved changes to physical layout of the office

Following an ergonomic assessment and recommendation by County Risk Management, ordered new chairs that meet the following criteria:

- Independent seat and backrest adjustment, adjustable armrests (width & height)
- Adjustable seat depth (seat slider)
- Pneumatic seat height adjustment
- Seat pan tilt adjustment
- Backrest (lumbar support) height adjustment
- Adjustable seat back tilt mechanism that will help limit static exertion of the lower back

c. Offer enterprise training on topics intended to strengthen SJCERA's succession planning

The Leadership Team identified a list of potential training topics for staff including investments, project management, communication skills and team work. The following trainings and educational materials were provided to SJCERA staff:

- *4 Tips to Kickstart Honest Conversations at Work*: TED Talk Video provided to all staff
- *Why Great Leaders Speak Last*: Article provided as required reading for management team.
- *Difficult Conversations*: a half-day course providing SJCERA's managers and supervisors a step-by-step approach to identify, understand, prepare for, and conduct the most challenging conversations.
- *Project Management*: a six-hour "Managing Real World Projects" training (held over 3 days via Zoom) led by a University of the Pacific affiliated facilitator provided to all staff.
- *Disability Retirement*: a half-day course sponsored by CALAPRS, augmented by reading and discussion facilitated by ACEO, Kathy Herman provided to three Member Services staff.
- *Ethics* training: In compliance with the Board of Supervisors' policy adopted September 14, 2021, provided to all staff.
- *Investment Education:* Facilitated by Investment Officer Paris Ba, interested staff go through the CFA Investment Foundations education curriculum together.

d. Additional Efforts to Maintain a High-Performing Workforce

In addition to the goals specifically identified in the Action Plan, the following employee recognition programs and events were provided to support and appreciate staff.

Random Acts of Kindness Week (February 16-19). Each day, staff received a small (sweet) surprise on their desks.

Employee Appreciation Week (March 1-5). Provided appreciation-related snacks each day of the week (e.g., "Donut what we'd do without you"), and provided lunch on Friday.

Earth Day Treasure Hunt (*April 22).* When staff arrived in the office, they discovered seed packets with Jeans Day coupons attached hidden throughout the office. The surprise element created quite a bit of excitement.

Employee Shout Out Board. Instituted an Employee Shout-Out board, where staff can publicly recognize each other. Employees are awarded with Jeans Day coupons.

Various Other Festivities. Celebrated the hiring of new staff and staff retirements, as well as various holidays including: Cinco de Mayo (with frozen juice bars); Independence Day with hotdogs and fixings; Halloween with costumes, potluck, and contests for cubicle decorations; Year-End with a catered lunch, ugly sweater contest and gift exchange.

e. Hired Talented Staff

- Throughout the country baby boomers are retiring: SJCERA's experience echoes that trend. A number of long-term employees retired, creating the opportunity to hire new talent and/or promote existing staff members into higher level positions. SJCERA hired and on-boarded the following positions. Hired and Oriented in 2021: Investment Accountant; Retirement Technician (3 positions); Accounting Technician II; Administrative Secretary. Hired in late 2020, Oriented in 2021: Investment Officer; Finance Officer; Retirement Services Associate.

- Prepared for and conducted Assistant CEO (ACEO) recruitment. Modified the ACEO salary range to reflect current market rate. The CEO and current ACEO actively reached out to their professional networks to encourage applicants. Interviewed highly qualified candidates, resulting in the incoming ACEO starting in January 2022.

7. Manage Emerging Organizational Needs

a. Assess need to issue RFPs for example for Custodian Bank, Investment Counsel, and Writing of Pension Administration RFP

i. Custodian Bank.
Staff surveyed other California pubic retirement systems and concluded SJCERA should retain Northern Trust as SJCERA's custodian bank. To confirm SJCERA is receiving competitive pricing and services, staff reviewed MCERA's recent contract with Northern Trust.

ii. Investment Counsel.
SJCERA received proposals from a number of qualified law firms, including the incumbent. The Evaluation Team has reviewed the proposals; interviews with finalists are scheduled in January.

iii. Writing of PAS RFP.
See 2.a.ii above.

b. Identify and begin implementing a 2022 Strategic Planning process

SJCERA awarded a contract for Strategic Planning services to Mosaic Governance Advisors following a targeted search. In December, the Board reviewed, and approved with minor changes, SJCERA's 2022-2026 strategic plan representing the culmination of months of collaboration and analysis with input from staff, SJCERA leadership, employers, customers, trustees, and key consultants. The final version, incorporating the changes requested in December, will be provided in the January 2022 Board meeting materials.

c. Implement Tier 2b

At its May 2021 meeting, the Board determined Pensionable Compensation will be base pay only for all individuals who become SJCERA members for the first time on or after January 1, 2022 and who do not establish reciprocity. SJCERA's IT staff has worked with both the County and Superior Court to clarify the requirements so the data can be imported correctly. The first payroll file with Tier 2b members will arrive on January 20.

d. Litigation

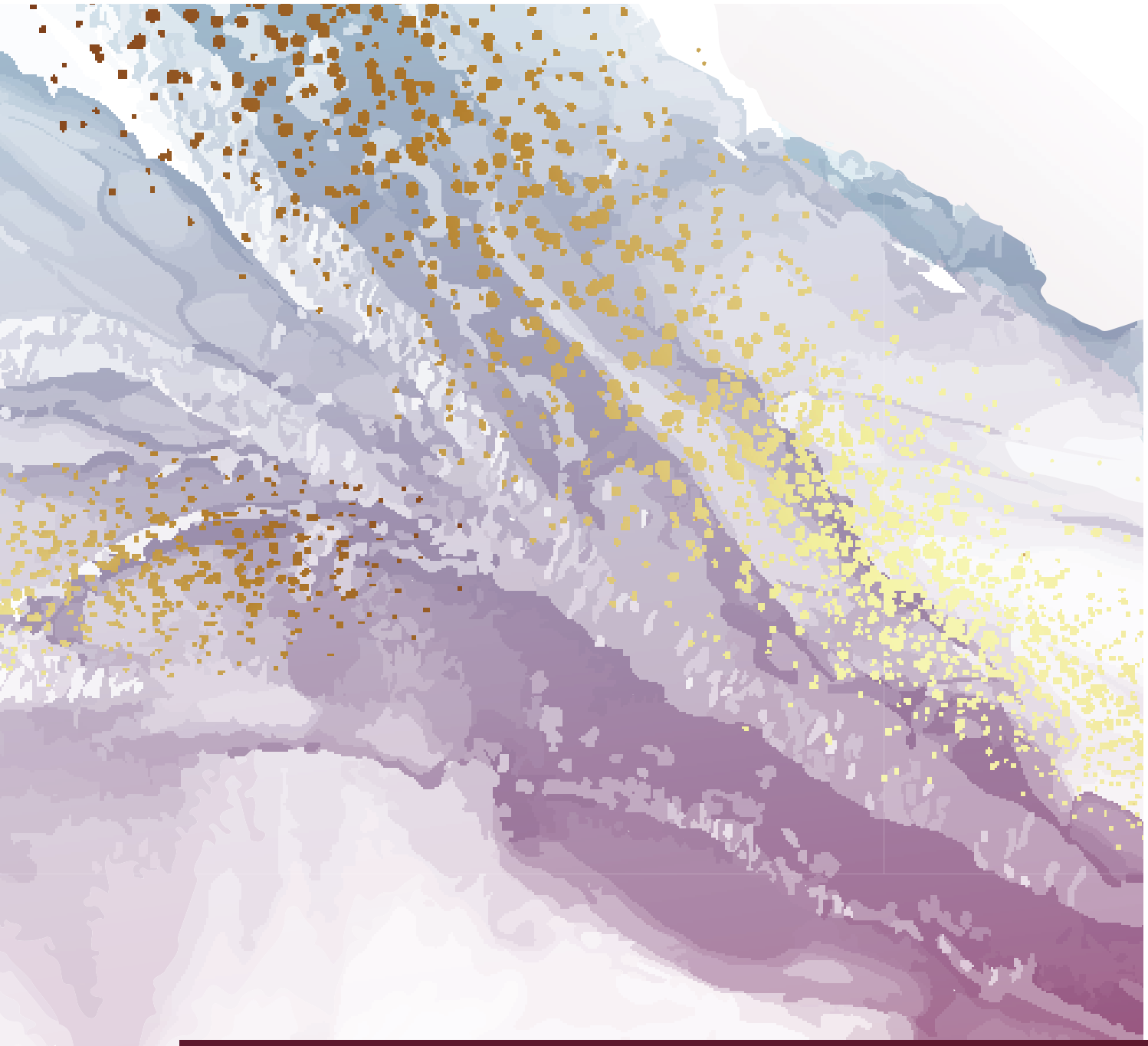
SJCERA prevailed in both Allum v. SJCERA (the Post-82 matter) and SJCERA v. Travelers (regarding SJCERA seeking coverage under a fiduciary liability insurance policy). SJCERA is now pursuing reimbursement of costs and fees as appropriate.

c. Implement Tier 2b

At the May meeting, the Board determined Pensionable Compensation will be base pay only for all individuals who become SJCERA members for the first time on or after January 1, 2022 and who do not establish reciprocity. County Payroll and County ISD have sent Tier 2b payroll test files and our IT Department is using them to identify the programing changes needed in our current pension administration system in order to successfully load and integrate Tier 2b data when it arrives in January. The Courts and their payroll vendor, ADP, are on schedule to meet the new requirements for their transmittal file.

d. Litigation

SJCERA prevailed in both Allum v. SJCERA (the Post-82 matter) and SJCERA v. Travelers (regarding SJCERA seeking coverage under a fiduciary liability insurance policy). SJCERA is now pursuing reimbursement of costs and fees as appropriate.



2022 – 2026 STRATEGIC PLAN

San Joaquin County Employees' Retirement Association

December 10, 2021

INTRODUCTION

Creating New Foundations for Our Future

In 1946, the San Joaquin County Board of Supervisors established the San Joaquin County Employees' Retirement Association ("SJCERA") to provide retirement, disability, and death benefits to the employees of the County and other participating employers ("Special Districts") that provide valuable services to residents of San Joaquin County. Today, after 75 years, SJCERA is proud to serve as an essential element to the retirement security of San Joaquin County and participating Special District public servants and their beneficiaries and an integral part of the local economy.

Although SJCERA is known by its members for its professional, knowledgeable, and responsive customer service, the environment in which it operates is complex and rapidly changing. The COVID-19 pandemic has unlocked new ways of working and communicating that the world is only beginning to understand. Service expectations among members and employers are multi-faceted, complexity in the investment markets is increasing, and the need to accurately, efficiently, and securely manage and process data and information is critical to our ongoing operations and the confidence of all stakeholders. At the same time, upholding continued strong financial management and funding discipline of the Retirement Plan is critical.

It is with this set of circumstances that the SJCERA Board of Retirement ("Board") and its management staff ("Leadership Team") embarked on a collaborative process to develop a five-year strategic plan for the years 2022 through 2026. Critical steps in the process included the following activities:

- Gathering and analyzing sentiment from SJCERA stakeholders including representatives of participating employers, all SJCERA staff, members and beneficiaries, and select consultants to the Board,
- Conducting a comprehensive assessment of SJCERA's internal and external operating environment, including strengths, weaknesses, opportunities, and threats,
- Developing a 10-year future vision of a successful SJCERA,
- Identifying significant priorities and critical themes that required a strategic response from SJCERA, and
- Engaging in discussion on issues vital to the SJCERA's continued long-term viability.

About the Cover Design

Just as the SJCERA pension is the backbone to a secure retirement for its members and beneficiaries, the San Joaquin River has a long history of supporting a vibrant San Joaquin Valley. | The cover design for the 2022-2026 SJCERA Strategic Plan reflects an impressionist interpretation of the San Joaquin River at the time of California's gold rush. | Since that time, the San Joaquin Valley has grown into a modern and highly technological agricultural industry, and the River continues to play a vital role both anchoring the community and connecting it to other counties. Together, the people and riverscape are essential to supporting the residents and businesses that call San Joaquin home.

Through the work completed by the Board and Leadership Team, SJCERA developed a framework for its strategic plan ("Strategic Plan"). In doing so, SJCERA is balancing its high-performance expectations today with its future aspirations.

The SJCERA Strategic Plan reflects the first five years of a ten-year journey to strengthen the long-term financial health of the Retirement Plan, modernize operations, and align people and resources with the ten-year vision. The Strategic Plan reflects what the Board and staff collectively aspire to achieve on behalf of members and beneficiaries and aligns the strategic choices made today and over the next five years.

The Strategic Plan enables SJCERA to transition to a modern operating model, leveraging new technologies to enhance service productivity, accuracy, and efficiency. During the transition, SJCERA commits to continuing its focus on core operations - collecting contributions, administering benefits, paying pensions, and investing assets – while putting people first. SJCERA has significantly benefited from consistency in its knowledgeable and committed Board and professional and caring staff, and a successful transition is dependent upon them.

In aligning SJCERA's strategy with its future vision, a foundation is set for SJCERA to operate for the next decade and beyond. By 2026, SJCERA will be administering the Retirement Plan and delivering services in a modern way. SJCERA expects to work collaboratively with its stakeholders during its transition.

On behalf of everyone involved in the strategic planning process, the Board and Leadership Team invite you to review SJCERA's Strategic Plan on the following pages and join us in partnership through this journey.

MISSION

Administering pensions to provide members a secure retirement benefit.

VISION

Your trusted partner delivering contemporary retirement services with care.

VALUES

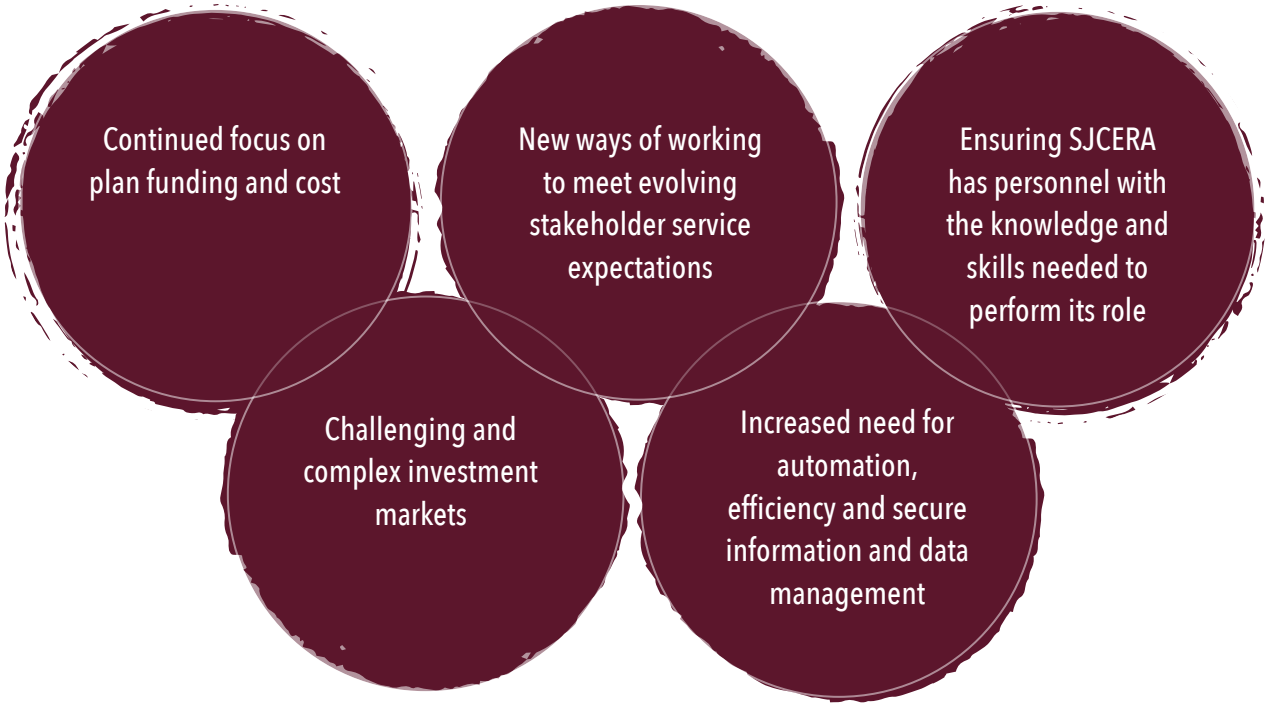
Integrity
We honor our commitments and can be trusted to do the right thing.

Service
Being respectful and helpful is at the heart of who we are.

Accountability
We take pride in our work and continuously improve ourselves.

ISSUES ON THE HORIZON

As part of the strategic planning process, SJCERA scanned its internal and external operating environments. Strengths, weaknesses, opportunities, and threats on the immediate and near-term horizon were identified. As a result, SJCERA believes five significant and interconnected priorities will most impact the Retirement Plan, operations, and its membership and, therefore, deserve a focused response. The priorities are summarized in the following illustration.



STRATEGIC GOALS

SJCERA's approach to addressing the issues on its immediate and near-term horizon requires a committed focus to advancing the following three areas:

GOAL 1

Strengthen the long-term financial health of the Retirement Plan.

GOAL 2

Modernize the operations infrastructure.

GOAL 3

Align resources and organizational capabilities.

Further information on how SJCERA intends to make progress towards these Goals in the coming five years and what success under the Strategic Plan will look like under a ten-year vision for each is delineated on the following pages.

GOAL 1

Strengthen the long-term financial health of the Retirement Plan.

Objectives

A. Evaluate the appropriateness of actuarial assumptions.

B. Review and confirm or refresh asset allocation.

C. Determine the future vision for the investment program operating model.

D. Optimize the investment manager lineup.

E. Explore alternative approaches to addressing risk through plan design.

F. Define emerging governance issues.

What will success look like?

SJCERA's approach to delivering on these objectives will be successful if meaningful progress toward the following performance aspirations is realized within the first five years of SJCERA's ten-year vision.

1. The Retirement Plan is on its longer-term path to full-funding.
2. The Board's appropriately balanced risk posture supports benefit payments.
3. Retirement Plan actuarial assumptions are reasonable and appropriate.
4. Portfolio costs are prudently managed.
5. SJCERA's views on environmental, social, and governance (ESG) matters, including diversity, equity, and inclusion, is defined for the organization and investment portfolio.

Key actions to be taken each year to further this Goal are defined through SJCERA's Annual Action Plan set by the Chief Executive Officer.

GOAL 2

Modernize the operations infrastructure.

Objectives

A. Implement the Pension Administration System (PAS).

B. Enhance the member experience.

C. Improve technology for business operations.

D. Improve the employer experience.

What will success look like?

SJCERA's approach to delivering on these objectives will be successful if meaningful progress toward the following performance aspirations is realized within the first five years of SJCERA's ten-year vision.

1. SJCERA is known for its self-service innovation, automation, accuracy, and efficiency.
2. The PAS has been successfully implemented; members, employers, and SJCERA staff all embrace and benefit from the PAS.
3. Members and employers enjoyed a positive service experience from SJCERA throughout the transition to the PAS.
4. The disaster recovery and business continuity plan and practices reflect contemporary practices.
5. Appropriate security measures have been implemented and are maintained to industry standards to protect SJCERA confidential information.
6. SJCERA has leveraged online learning and implemented fully automated online benefit and account management tools for members.
7. SJCERA staff is viewed by employer human resources and payroll representatives as a valuable partner and a problem-solver.
8. SJCERA's Board of Retirement, Leadership Team, and staff are proud of their collective achievements.
9. SJCERA's member education and accessible member information results in engaged, educated, and retirement-ready members and satisfied employers.
10. Stakeholder relationships are healthy and productive.

Key actions to be taken each year to further this Goal are defined through SJCERA's Annual Action Plan set by the Chief Executive Officer.

GOAL 3

Align resources and organizational capabilities.

Objectives

A. Develop and implement a workforce planning process.

B. Enhance education and development across all levels of the organization.

C. Implement practices to support Board continuity and evolution.

D. Create a foundation of performance metrics and measurements.

What will success look like?

SJCERA's approach to delivering on these objectives will be successful if meaningful progress toward the following performance aspirations is realized within the first five years of SJCERA's ten-year vision.

1. The Board maintains its focus at the policy level.
2. The Board's collegial, diverse culture and institutional knowledge is upheld.
3. SJCERA is a vision-centric, focused organization with clear, well-defined goals and objectives.
4. The Leadership Team sets high standards and empowers staff to take ownership of responsibilities in alignment with the SJCERA mission.
5. SJCERA's succession planning efforts create continuity for both the Board and Leadership Team, and personnel changes at all levels are addressed seamlessly.
6. SJCERA's professional staff are adaptable to the changing work environment; they are proud to work at SJCERA.
7. Members, employers, and the County Board of Supervisors understand and value SJCERA's role and benefits.

Key actions to be taken each year to further this Goal are defined through SJCERA's annual action plan set by the Chief Executive Officer.

CONCLUSION

The next five years reflect a pivotal time in SJCERA's journey as a pension administrator. In committing to this five-year Strategic Plan, SJCERA is setting a foundation from which to operate for the next decade and beyond. The Strategic Plan reflects a prudent response to the issues on SCJERA's immediate and near-term horizon.

SJCERA takes pride in the decades of service it has delivered to its members and beneficiaries and is inspired to build upon this history to realize its future vision.

Board of Retirement Meeting
San Joaquin County Employees' Retirement Association

Agenda Item 10.05-03

January 21, 2022

SUBJECT: Updated 2022 Action Plan

SUBMITTED FOR: ____ CONSENT __ ACTION _X_ INFORMATION

PURPOSE

To align the Draft 2022 Action Plan (submitted in October 2021 as required by the *CEO Performance Review* policy) with the 2022-2026 Strategic Plan, approved in December.

DISCUSSION

In accordance with the *CEO Performance Review* policy, staff presented the 2022 Action Plan goals to the Board in October 2021. It was acknowledged that the Action Plan should document those portions of the Strategic Plan which staff plans to implement that particular year. However, in October, SJCERA was still in the midst of its 2022-2026 strategic planning process. Staff and Trustees agreed that the 2022 Action Plan submitted in October would be considered a draft and used to help guide budget planning. It was further agreed that, upon completion of the Strategic Plan, the Action Plan would be updated as needed to align with the approved Strategic Plan. The attached Updated 2022 Action Plan aligns the previously submitted action plan tasks with SJCERA's 2022-2026 Strategic Plan, which the Board approved in December.

The updated Action Plan lists each of the Strategic Plan's three, high-level goals (1. Strengthen the long-term financial health of the Retirement Plan; 2. Modernize the operations infrastructure; and 3. Align resources and organizational capabilities) and those objectives from strategic plan that staff plans to work on in 2022 (listed at the a, b, c level of the outline). The specific action items staff plans to perform in 2022 in support of the strategic objectives are listed at the i, ii, iii level of the outline.

Progress on the 2022 action plan items will be reported in the monthly CEO report and our twice-yearly Action Plan Update reports (the mid-year report in June, and the year-end report in January.)

ATTACHMENTS

2022 Updated Action Plan

JOHANNA SHICK
Chief Executive Officer

2022 Action Plan

San Joaquin County Employees' Retirement Association

1. **Strengthen the long-term financial health of the Retirement Plan**
    a. Evaluate the appropriateness of actuarial assumptions
        i. Conduct Actuarial Experience Study to assess the appropriateness of, and impact of COVID-19 on key actuarial assumptions

    b. Review and confirm or refresh asset allocation
        i. Conduct Asset-Liability Study to assess Board's risk tolerance and the level of risk needed to meet the actuarial assumptions
        ii. Optimize Strategic Asset Allocation policy in light of studies and market projections.
            1. Review fixed income and other asset classes
            2. Conduct a pacing study of private market assets
        iii. Deliver target investment return

    c. Optimize the investment manager lineup
        i. Conduct a review of current managers and mandates to better align with our Strategic Asset Allocation policy

2. **Modernize the operations infrastructure**
    a. Implement Pension Administration System (PAS)
        i. Contract with Project Manager to lead PAS Implementation and Data Conversion projects
        ii. Contract with Pension Administration System (PAS) vendor
        iii. Contract with Data Conversion vendor
        iv. Identify project risks and mitigations
        v. Program/Test new PAS
        vi. Maintain functionality of legacy PAS until new PAS is implemented and stabilized

    b. Enhance the member experience
        i. Complete improvements to website architecture and functionality
        ii. Identify the conditions necessary to enable a full-service member portal, and develop and initiate a plan to fulfill those conditions

    c. Improve technology for business operations
        i. Adopt industry standard business processes wherever possible
        ii. Refine new PAS requirements to support business processes and performance measurements
        iii. Implement recommended items resulting from 2021 cybersecurity and disaster recovery plan assessments
        iv. Begin Windows Server infrastructure implementation
        v. Begin Enterprise-Wide Risk Management (EWRM) methodologies implementation

3. **Align resources and organizational capabilities**
    a. Develop and implement a workforce planning process
        i. Address project staffing and training needs
        ii. Implement strategies designed to support staff and maintain morale during PAS project
    b. Enhance education and development across all levels of the organization
        i. Offer training and development opportunities intended to strengthen SJCERA's on-boarding and succession planning

THE NCPERS
MONITOR
The Latest in Legislative News
December 2021

In This Issue

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It's always good to pause and take stock during the holiday season. For NCPERS and its members that includes a review of what Congress and the President are doing that could affect our public pension community.

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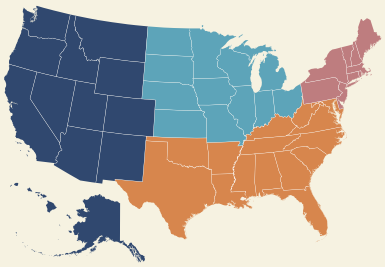
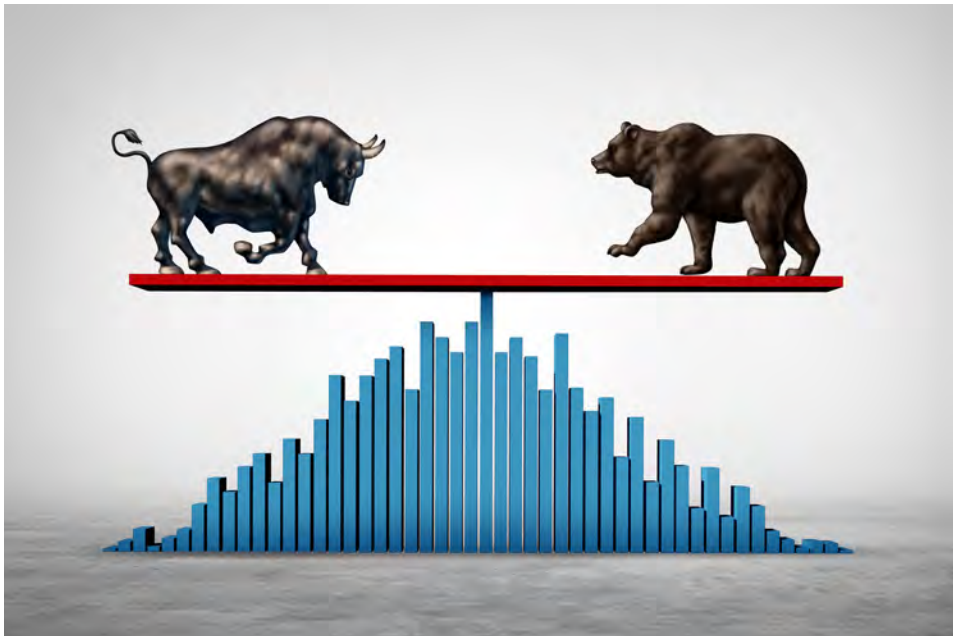
Enhancing Sustainability of Public Pensions, new research from NCPERS will focus on gauging the fiscal adjustments governments could make to ensure the sustainability of public pensions, building on our previous research briefs.



This month, we will highlight Vermont, Minnesota, Mississippi and New Mexico.

Milliman Funding Survey Highlights Impact of Past Year's Market Surge



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Propelled by surging financial markets, public pensions achieved an aggregate funded ratio of 85% in the fiscal year that ended June 30, according to an analysis of the 100 largest U.S. plans by actuarial and consulting firm Milliman.

The results are a big jump from a funded ratio of 70.7% a year earlier and reflected an average annual return on assets of 27% among the 100 largest plans, Milliman said in a white paper, *2021 Public Pension Funding Study*.

"While the significant improvement in funded status is welcome news to public pension plan stakeholders, it is important to remember that a market correction could quickly send plan assets down to more typical levels," the Milliman white paper said.

The firm estimated that assets of the 100 largest plans stood at $4.82 trillion as of June 30, up from $3.90 trillion a year earlier. Liabilities rose to $5.67 trillion as of June 30, up from $5.50 trillion a year earlier. As a result, Milliman's estimate of the gap between current assets and long-term liabilities declined to $850 billion at midyear-2021, down from $1.60 trillion a year earlier.

CONTINUED ON PAGE 5

The Year in Review

By Tony Roda

Photo illustration © 2021 iStock.com

It's always good to pause and take stock during the holiday season. For NCPERS and its members that includes a review of what Congress and the President are doing that could affect our public pension community.

On the broader front, the $1.2 trillion bipartisan infrastructure bill was recently signed into law. The bill will provide much-needed improvements to our core infrastructure assets and add jobs to jumpstart the economy. The House also approved a $1.75 trillion spending bill, called the Build Back Better Act, which includes funding for child care and universal pre-K, direct negotiations on drug prices between the federal government and manufacturers, increased deductibility of state and local taxes, and policies aimed at mitigating the effects of climate change.

On the pension front, early this year legislation was enacted to provide financial relief to struggling multiemployer pension plans, "Taft-Hartley" plans. This legislation was years in the making and will provide retirees in these private sector plans with the financial security they were promised.

The most comprehensive retirement legislation now pending in Congress is commonly known as the SECURE Act 2.0 (H.R. 2954).

You will recall that the original SECURE Act was signed into law in 2019. The SECURE Act 2.0 was approved in May unanimously by the House Ways and Means Committee. It is designed to increase opportunities to save for retirement. Many of the provisions would affect retirement plans sponsored by state and local governments, such as the following:

- Increase the age trigger for Required Minimum Distributions incrementally to age 75 by 2032;
- Allow 403(b) plans to invest in collective investment trusts and join multiple employer plans;
- Provide additional flexibility for plan fiduciaries when seeking to recoup inadvertent retirement plan overpayments;
- Allow employer matching contributions on account of student loan payments for 457(b), 403(b), and 401(k) plans;
- Eliminate the first-day-of-the-month rule for 457(b) plans to provide more flexibility to participants to make changes in elective deferral amounts;
- Exclude from tax certain disability payments for first responders;
- Increase the annual limits on catch-up contributions to $10,000 for those age 62-64 for 457(b), 403(b), and 401(k) plans; and

CONTINUED ON PAGE 6

NCPERS Research Identifies New Approach for Evaluating Sustainability

Photo Illustration © 2021, iStock.com

As public pension professionals, we all spend a lot of time addressing simplistic criticisms. Patiently, we explain that pensions are an earned benefit, that no one is getting rich on a retirement paycheck that averages $28,851 a year, and that funded ratios aren't the last word on a pension plan's health.

The absolutist mindset is that if a pension fund can't pay out every dime of future benefits today, it's not adequately funded.

We also talk about sustainability because it is the key to understanding pensions. For over a century, governments have entered a compact with their employees by offering pensions. They promise that they can and will pay the benefits for which public servants have worked so hard—and to which workers have also contributed. Governments have to be systematic and disciplined in accumulating funds for future benefit payments to honor this pledge.

That's what we mean by sustainability. It's a common-sense concept that unfortunately gets tangled up with absolutist thinking of people who wish pensions would go away. The absolutist mindset is that if a pension fund can't pay out every dime of future benefits today, it's not adequately funded. This, of course, is as ludicrous as thinking your mortgage is in default if you can't pay off the entire balance today. Mortgages don't work like that, and neither do pensions. Just as mortgages are paid off slowly and steadily from ongoing income, pension assets are accumulated through regular contributions made over a long time.

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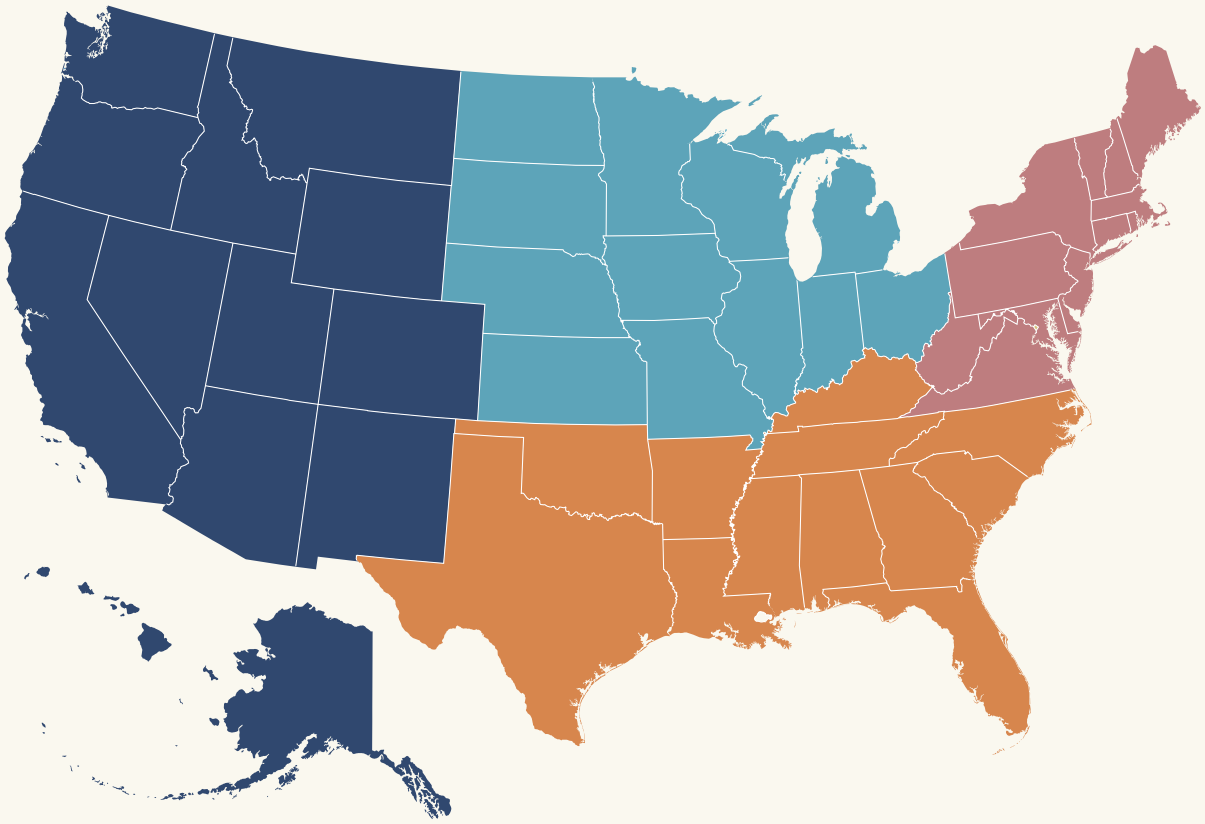
This month, we will highlight Vermont, Minnesota, Mississippi and New Mexico.



NORTHEAST: Vermont

In December, a Vermont task force is preparing to issue a final report containing recommendations on the benefits, design, and funding of retirement and retiree health benefit plans for state employees and teachers.

The report, which will culminate meetings and public hearings that have been ongoing since July to collect stakeholder feedback, is expected to set the stage for action during the 2022 legislative session.

Unfunded liabilities in Vermont's pension system are projected to increase by over $600 million between state employees and teachers next year, according to the Pension Benefits, Design, and Funding Task Force.

In April, the legislature formed the task force after a public pension overhaul bill attracted a strong backlash from teachers and employees, including public demonstrations in opposition. As a result, the legislature pulled back on a plan that would have had teachers working longer into their retirement, among other unpopular features, saying that more study was needed.

In an interview with WFFF-TV in Burlington, task force member Kate McCann said many principles had guided the task force. These include "honoring state commitments to employees, pension system sustainability, minimizing impacts of any changes to employees who are near retirement, making no changes to already retired employees, and ensuring that employees don't have to work longer to qualify for a benefit," said McCann, who is a teacher in Montpelier.

McCann added that Vermont's current budget surplus creates an opportunity to stabilize pensions by putting as much one-time funding as possible toward reducing unfunded liabilities.

CONTINUED ON PAGE 7

MILLIMAN FUNDING SURVEY CONTINUED FROM PAGE 1

Milliman warned that the recent strong market performance might not provide any budgetary relief because most pension systems use one or more smoothing procedures to limit the impact of market volatility on contribution levels.

The analysis also noted that there is little correlation between the generosity of the benefits paid and the plan's funded status. In other words, "plans with generous benefits are neither better-funded nor more poorly funded than plans with modest benefits."
In other key findings:

- Total pension liability of the top 100 plans ranging from $11 billion to $521 billion.
- Some 47% of the pension plans studied had funded ratios of 90% or better as of June 30, up from 13% a year earlier.
- In all, 19% of the pension plans had funded ratios of 60% or less as of June 30, down from 30% a year earlier.
- The number of active plan members remained steady at 12.5 million in the year ended June 30, while the number of inactive and retired members rose 2.8% to 14.8 million.
- Member contributions rose 4%, to $52 billion, in the 12 months through June 30, while employer contributions rose 9%, to $157 billion.
- Overall asset allocation has changed very little over the recent years, "with just a modest, gradual shift from equities to alternative investments." Private equity, real estate, and alternatives (i.e., not equities, fixed-income, or cash) rose to 28% of holdings in 2021 versus 23% in 2013.
- Reflecting a consensus on long-term future investment returns, 95% of the plans had a rate of return assumptions of 7.5% or less, down from 90% a year earlier. Nearly a quarter of the plans (24%) reduced their assumptions since the year-ago report.
- In the 12 months leading up to June 30, 2022, the plans are projected to receive $225 billion in contributions from employers and members and payout $323 billion in benefits and administrative expenses, for a net cash outflow of $98 billion. ◆

EXECUTIVE DIRECTORS CORNER CONTINUED FROM PAGE 3

Enhancing Sustainability of Public Pensions, new research from NCPERS will focus on gauging the fiscal adjustments governments could make to ensure the sustainability of public pensions, building on our previous research briefs.

We've developed a new tool—Sustainability Valuation—that we believe can be incorporated into prevailing funding policies and practices. Using Sustainability Valuation, pension systems can monitor their fiscal resources and identify any needed adjustments to remain on track.

I started by noting that there are people who would like to see a world without pensions for reasons grounded in political dogma. They have deep faith in the ability to free markets to right all wrongs, and they throw around irresponsibly high "funding shortfall" numbers to undermine the tried-and-true approach of pensions.

What our research shows is that their focus on big, scary numbers is misplaced. Pension funds can be brought into fiscal balance by making relatively small adjustments, on the order of 3% of assets. And while there's no denying that 3% of a multi-trillion-dollar figure is still a lot of money, it works out to be about one-seventh of the $1 trillion shortfalls that is frequently bandied about, and it can be replenished from governmental cash flows over several years.

Our research shows that maintaining a stable ratio between unfunded liabilities and the economy is more important to a plan's sustainability and ability to pay benefits than focusing on unfunded liabilities and funding levels in isolation. Pension systems can use our Sustainability Valuation formula to monitor their fiscal well-being on an ongoing basis and make fiscal adjustments to make and keep them fiscally sustainable for the long haul.

You'll be hearing more from NCPERS about Sustainability Valuation early next year. The *Enhancing Sustainability of Public Pensions* report will be released in January 2022. Then Dr. Michael Kahn, author of the report and NCPERS Research Director, and I will host a webinar to highlight significant takeaways from the report. We look forward to answering your questions about this novel tool and how it can help you tell your own pension-funded ratio story.

Till then, I wish you a Happy Holidays and a healthy and prosperous New Year! ◆

THE YEAR IN REVIEW CONTINUED FROM PAGE 2

- Require the Roth method for catch-up contributions, i.e. contributions must be made with after-tax dollars, for the plans listed above.

In addition, efforts are being made to attach to the SECURE Act 2.0 modifications to the Healthcare Enhancement for Local Public Safety Act, known as HELPS. This provision, Section 402(l) of the federal tax code, allows retired public safety officers to exclude from gross income up to $3,000 per year from governmental retirement plan distributions, provided the monies are paid directly from the retirement plan to a health care or long-term care provider. The proposed changes would increase the annual exclusion amount, index the exclusion amount in subsequent years, and repeal the direct payment requirement.

The revenue-producing provisions of the Build Back Better Act include new limitations on certain high-income taxpayers, which are defined as single filers or married taxpayers filing separately with taxable income over $400,000, heads of households with taxable income over $425,000, and married taxpayers filing jointly with taxable income over $450,000.

For these taxpayers the bill would prohibit further contributions to a Roth or traditional IRA for a taxable year if the total value of the individual's IRA and defined contribution retirement accounts, e.g., IRC Section 401(a) defined contribution plans (including 401(k) plans), 403(b) plans, and governmental 457(b) plans, generally exceeds $10 million as of the end of the prior tax year.

In such cases a special required minimum distribution (RMD) would be mandated. The RMD generally would be 50 percent of the amount by which the individual's prior year aggregate traditional IRA, Roth IRA, and defined contribution account balance exceeds $10 million. If the aggregate account balance exceeds $20 million, the RMD would be 100 percent of the amount needed to lower the balance to $20 million. In addition, Roth conversions would not be permitted for these high-income taxpayers.

Finally, the legislation would add a new annual reporting requirement for employer-sponsored defined contribution plans on aggregate account balances in excess of $2.5 million. The reporting would be both to the IRS and the plan participant. It is unclear why this data would be collected. However, it is reasonable to conclude that changes to the tax rules affecting aggregate retirement account balances in excess of $2.5 million may be proposed in the future.

Of interest to many public sector workers is the Social Security penalty known as the Windfall Elimination Provision (WEP), which reduces your Social Security benefit if you earn a retirement benefit from non-Social Security covered employment. Twenty five percent of all public employees are not covered by Social Security and may be impacted by the WEP penalty, which could result in receiving up to almost $6,000 less in their Social Security benefit each year.

Legislation has been introduced in Congress to repeal WEP and the Government Pension Offset (GPO) penalties – S. 1302 by Sen. Sherrod Brown (D-OH) and H.R. 82 by Rep. Rodney Davis (R-IL). In addition, WEP-only legislation by House Ways and Means Committee Chairman Richard Neal (D-MA) and Kevin Brady (R-TX) would provide rebates to those currently hit by the penalty and subject new Social Security recipients to a proportional formula – H.R. 2337 and H.R. 5834, respectively. Finally, House Social Security Subcommittee Chairman John Larson (D-CT) has introduced a comprehensive Social Security reform bill, which will shore up the funding structure for the entire program, make enhancements to benefits, and repeal both WEP and GPO – H.R. 5723.

Before the end of the 117th Congress, which will occur in January 2023, we should see a resolution of many of these pending issues. The Build Back Better Act is likely to be enacted in the next few weeks, the SECURE 2.0 Act is expected to be finalized sometime next year, and while Social Security legislation is not expected to be completed in this Congress, there is hope that substantial progress can be made.

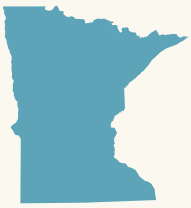
Please know that NCPERS will keep its members apprised of significant developments on these and other key issues for public pension plans. Happy Holidays! ◆

Tony Roda is a partner at the Washington, D.C. law and lobbying firm Williams & Jensen, where he specializes in federal legislative and regulatory issues affecting state and local governmental pension plans. He represents NCPERS and statewide, county, and municipal pension plans in California, Colorado, Georgia, Kentucky, Ohio, Tennessee, and Texas. He has an undergraduate degree in government and politics from the University of Maryland, J.D. from Catholic University of America, and LL.M (tax law) from Georgetown University.

AROUND THE REGIONS CONTINUED FROM PAGE 4

She said the concept of later retirement ages had not been scrapped, but if adopted, there needs to be more carrot and less stick in the approach. McCann said that the task force has "looked at ways to incentivize people to work just a little longer if they choose to," McCann said. "This must be a choice and would be awarded some additional benefit."

MIDWEST: Minnesota



A small Minnesota city with a well-funded pension plan has approved an increase in the retirement benefits offered to its volunteer firefighters.

The Long Lake City Council approved paying firefighters $7,000 per year of service in retirement, up from $6,000 previously. The increase was sought by the Long Lake Fire Department Relief Association. The fire department provides service in the cities of Long Lake, Medina, and Orono.

Vesting in the pension begins at 60% for employees with ten years of service, rising to 100% at 20 years.

The city council has approved increases in the benefit level five times since 2014, raising the level to $3,400 per year of service. However, the Long Lake Fire Department Relief Association did not ask for increases in 2016, when the rate of return was negative, and the funding ratio dropped below 110%, or in 2019.

SOUTH: Mississippi

The Public Employees' Retirement System of Mississippi board voted to reduce the pension fund's expected rate of return to 7.55%, from 7.75%, the *Northside Sun* newspaper reported.

The board approved the reduction unanimously at PERS's October 26 board meeting, the newspaper said. The change comes on the heels of a spectacular 32.71% rate of return for the fiscal year that ended June 30. The board's funding policy is that when actual returns exceed the assumed rate by 12% or more, return on investment assumptions must be reduced by 20 basis points.

The *Northside Sun* reported that the fund managed more than $35 billion as of June 30. PERS' latest investment report showed the figure had increased to $35.9 billion as of September 30.

PERS executive director Ray Higgins told the board that PERS paid $110 million in investment fees, which was less than the year before when PERS didn't meet its investment goals, the *Northside Sun* noted. There are 34 managers with 62 portfolios for PERS, according to Higgins.

CONTINUED ON PAGE 8

AROUND THE REGIONS CONTINUED FROM PAGE 7

WEST: New Mexico

Legislation to reform the Public Employees Retirement Association is likely to come before the New Mexico legislature in 2022, and revamping the membership of the board of trustees is shaping up as a focal point, the *Santa Fe New Mexican*, a daily newspaper, reported.

During the 2021 session, Rep. Phelps Anderson, an independent, sponsored legislation to change the composition from a 12-member elected panel to a 12-member appointed board. In addition, in a bid to professionalize the board, his bill would require at least six members who have a background in investments, finance, or pension fund administration.

It will be Gov. Michelle Lujan Grisham's decision to determine to push such reforms during the brief 30-day regular legislative session, Anderson told the newspaper. However, the Investments and Pensions Oversight Committee (IPOC), created by the Legislative Council in May, has homed in on professionalism during a series of oversight hearings aimed at crafting legislation.

The *Santa Fe New Mexican* reported on testimony to IPOC by PERS board member Lawrence Davis, who works in Albuquerque's budget office. He described petty behavior, infighting, and a "lack of technical proficiency" and urged lawmakers to consider overhauling the board structure. He noted that 10 of the 12 members are elected by other city, county, and state government workers and retirees.

Also pending is in the New Mexico legislature, the discussion draft of a House bill to create a Public Pension Investment Task Force is also pending. According to a bill filed on November 18, the 13-member panel would be tasked with evaluating whether the separate pension investment functions of the pension funds for teachers and public employees should be consolidated. ◆

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Calendar of Events 2022

May

Trustee Educational Seminar (TEDS)
May 21 – 22
Washington, DC

Program for Advanced Trustee Studies (PATS)
May 21 – 22
Washington, DC

NCPERS Accredited Fiduciary (NAF) Program
May 21 – 22
Washington, DC

Annual Conference & Exhibition (ACE)
May 22 – 25
Washington, DC

June

Chief Officers Summit
June 27 – 29, 2022
San Francisco, CA

August

Public Pension Funding Forum
August 21 – 23
Los Angeles, CA

October

Public Safety Conference
October 25 – 28
Nashville, TN

2021-2022 Officers

Kathy Harrell
President

Dale Chase
First Vice President

James Lemonda
Second Vice President

Carol G. Stukes-Baylor
Secretary

Will Pryor
Treasurer

Daniel Fortuna
Immediate Past President

Executive Board Members

State Employees Classification
Stacy Birdwell
John Neal

County Employees Classification
Teresa Valenzuela

Local Employees Classification
Sherry Mose
Thomas Ross
Ralph Sicuro

Police Classification
Kenneth Hauser
James Sklenar

Fire Classification
Dan Givens
Emmit Kane

Educational Classification
David Kazansky

Protective Classification
Peter Carozza, Jr.
Ronald Saathoff

Canadian Classification
Frank Ramagnano

The Voice for Public Pensions

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Website: www.NCPERS.org • E-mail: amanda@ncpers.org

CFA INSTITUTE RESEARCH FOUNDATION / **BRIEF**

CRYPTOASSETS
THE GUIDE TO BITCOIN, BLOCKCHAIN, AND CRYPTOCURRENCY FOR INVESTMENT PROFESSIONALS

MATT HOUGAN
DAVID LAWANT

CFA Institute Research Foundation

CRYPTOASSETS

The Guide to Bitcoin, Blockchain, and Cryptocurrency for Investment Professionals

Matt Hougan and David Lawant

CFA Institute Research Foundation

Statement of Purpose

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CRYPTOASSETS: THE GUIDE TO BITCOIN, BLOCKCHAIN, AND CRYPTOCURRENCY FOR INVESTMENT PROFESSIONALS

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INTRODUCTION

Bitcoin, blockchain, and cryptocurrencies burst onto the world stage in 2008, when the online posting of a pseudonymous white paper envisioned a new way to transfer value over the internet.[1]

In the decade-plus since, the cryptoasset market has gone through all the classic phases of a disruptive technology: massive bull markets and crushing pullbacks, periods of euphoria and moments of despair, FOMO (fear of missing out), fear, and everything in between.

As the cryptomarket enters its second decade, one thing is clear: Crypto and blockchains are not going away. Today, cryptoassets boast a combined market cap in excess of $350 billion;[2] major financial institutions, such as Fidelity Investments and CME Group, are heavily involved; large endowments, such as those of Harvard University, Yale University, and Stanford University, are investing, alongside such hedge fund legends as Paul Tudor Jones II; the crypto efforts of leading companies, such as Facebook, PayPal, Visa, and Square, are front-page news; and central banks, from the US Federal Reserve to the People's Bank of China, are discussing how to develop blockchain-enabled digital currencies of their own.

Despite all the excitement, however, significant challenges remain for investors approaching the market.

For starters, the quality of information is poor. Even such basic data as accurate trading volume are hard to come by. Theories about the drivers of cryptoasset valuations are untested and often poorly designed, and they are rarely—if ever—published in peer-reviewed journals. Due diligence efforts from leading consultants are in their infancy, and few people have carefully thought through the role (if any) that cryptoassets should have in a professionally managed portfolio.

More fundamentally, few people even understand what crypto really is or why it might matter. Is it an alternative currency? A technology? A venture capital investment? A specious bubble?

[1]Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," white paper, Bitcoin.org (31 October 2008). https://bitcoin.org/bitcoin.pdf.
[2]Data as of 30 September 2020 from CoinMarketCap (https://coinmarketcap.com).

Increasingly, people are deciding that now is the time to start answering these questions. For financial advisers, the reason is that clients are asking. For fintech executives and central bankers, it is because crypto and blockchains threaten to disrupt their markets. And for professional investors, it is because the returns and low correlations that cryptoassets, such as bitcoin, offer to this point are becoming hard to ignore.

The goal of this document is to provide the inquisitive investor with a clear-eyed guide to crypto and blockchain: what they are, what they are not, and where they might go from here. We want you to walk away confident in your understanding and armed with information to decide how to best position yourself for what is ahead.

Let's dive in.

PART I: THE BASICS—HOW CRYPTO WORKS AND WHY IT MATTERS

The best place to start in understanding crypto and blockchain is with bitcoin.

Bitcoin was the first cryptoasset[3] and today is the largest, and the breakthroughs that allowed bitcoin to emerge underlie all other blockchain and crypto projects. As a result, understanding bitcoin—where it came from, how it works, and what new opportunities and challenges it creates—provides a firm foundation on which to consider the entire crypto and blockchain space.

[3]Although bitcoin was the first successful cryptoasset to reach a significant scale, it built on previous failed attempts. The first such attempt traces back to the 1980s and the development of the Chaum blind signature. Bitcoin's technical architecture also borrows heavily from additional attempts, such as 1997's Hashcash and 1998's Bit Gold and B-Money.

Bitcoin can be approached from two complementary perspectives: as a solution to a long-standing technical problem and as an economic phenomenon that allows people to do things they could not have done before.

This section will attempt to tackle the first perspective, describing at a high level bitcoin's core technical architecture. After building this understanding, we will explore what new market opportunities this novel technical architecture creates.

Understanding Bitcoin: From a White Paper to a New Asset Class

Bitcoin was created by a pseudonymous computer programmer, working under the alias "Satoshi Nakamoto," who published a white paper on 31 October 2008 titled "Bitcoin: A Peer-to-Peer Electronic Cash System"[4] to a then-obscure mailing list of cryptographers. The author described a vision for how individuals could hold, send, and receive items of value digitally, without any trusted intermediary (e.g., a bank or payment processor) in the middle.

On 3 January 2009, shortly after the white paper was published, the software was released, the first bitcoin was minted, and the bitcoin network was launched.

The Problem Bitcoin Was Designed to Solve

As an initial reason why bitcoin (and the broader blockchain space) is important, consider this strange fact about modern life: Although much of our lives have migrated online, money remains stuck in an analog age.

[4]Nakamoto, "Bitcoin."

We do not think about this reality much because we have slick fintech apps and online bank accounts, but the underlying plumbing of our "modern" financial system is archaic. You can feel this, for instance, in the facts that wiring money abroad takes two to four days and paying bills using your online bank account requires an equal amount of time.

Many people assume that the reason our financial system is slow is that banks are lazy and refuse to update old systems, but that is not true. The problem is that transferring items of value online is difficult, harder by far than transferring basic information, such as text messages, emails, and photos.

Consider a simple transaction wherein Alice wants to send Bob $1,000. They do not live close to one another, so Alice cannot give Bob cash. Instead, she sends Bob a check. If Bob and Alice use the same bank, that is great: Bob can cash Alice's check and go on his way. But if Alice banks at Bank A and Bob banks at Bank B, things slow down.

Bank B is not going to credit Bob's account until it knows that Alice's check is good. If it did so immediately, Bob withdrew that money, and Alice's check subsequently bounced, Bank B would be out of luck. Processing that check—making sure Alice's account is not overdrawn and that she has not written multiple checks on the same account—takes days.

The right way to conceive of this problem is as a database problem. Bank A has a database of its accounts, and Bank B has a database of its accounts. However, Bank B cannot see into Bank A's database to know whether an individual account has enough money to allow a check to clear. The process of coming to consensus over the status of accounts—of each bank trusting the other—takes time. If you try to short-circuit that process, the potential for loss is significant.

Modern payment applications, such as Venmo, solve this problem by creating a walled garden with a single database: You can settle transactions instantly in Venmo, but only with another Venmo customer. Try to move your money out of Venmo, and things bog down. (Also, you have to trust Venmo to hold your money.)

Allowing money or items of value to move the way text messages do between any two people and without any central intermediary requires a different solution.

A Distributed and Decentralized Database

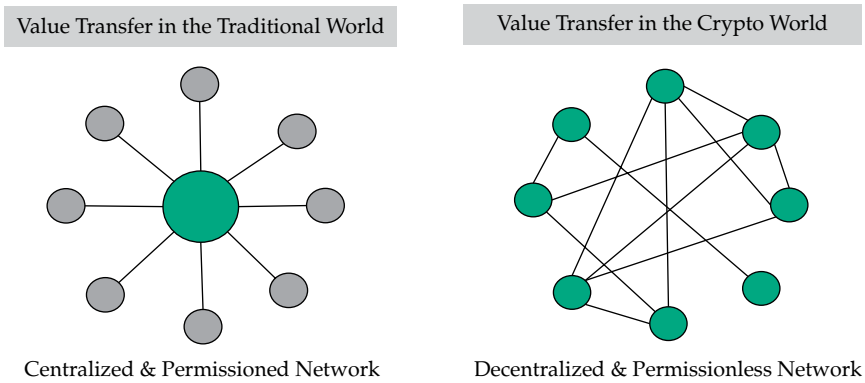
Nakamoto's solution to this problem (and the core idea behind all blockchain databases today) was to create a single distributed database that is accessible to everyone—where anyone in the world can view balances and submit transactions at any time—but where the ledger is not controlled by any single corporation, government, person, or entity. In other words, a "distributed ledger" that is "permissionless" and is maintained on a "decentralized" basis.

Figure 1 shows how this kind of distributed and decentralized database is structured and how it allows value to transfer directly on a peer-to-peer basis, without a trusted central intermediary.

The value of such a database is obvious. If every party can agree on the status of the database at any time, the delays required to allow Database A to sync with Database B can be massively reduced.

Although simple in concept, implementing this new database architecture involved surmounting several significant technical challenges that

FIGURE 1. CRYPTOASSETS DO TO VALUE WHAT THE INTERNET DID TO INFORMATION



had bedeviled computer scientists since the 1980s.[5] Chiefly, if you have copies of the same database floating around on a million different machines and no one is in charge, how do you make sure all copies are identical, are updated synchronously, and reflect only honest transactions?

In other words, how can one reliably create consensus about what is accurate and true?

This is the real breakthrough of blockchains: creating timely, bad-actor-proof consensus across all copies of a decentralized and distributed database. Doing so involves a cascading series of technological steps governed by clever incentives, cryptography, and other technological advancements. These steps lie at the heart of both the opportunities and the challenges created by blockchain applications, so understanding how they are structured and work is worthwhile.

How a Bitcoin Transaction Works

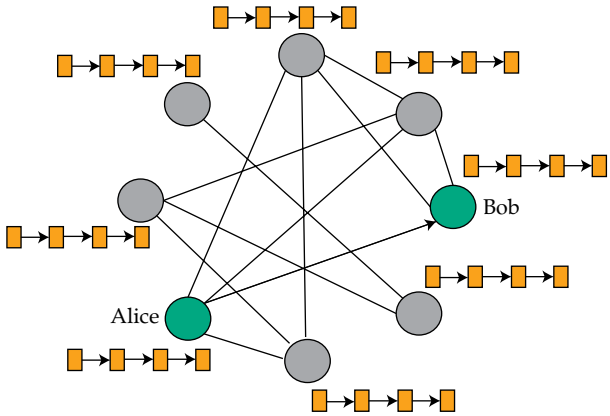
The best way to understand how the consensus formation process works is to follow a bitcoin transaction from start to finish.

Let's say that Alice has 10 bitcoin that she wants to send to Bob. Alice sends a message to all the computers that run a copy of the up-to-date database ("the Bitcoin network") that says, effectively, "I want to send 10 bitcoin to Bob." Alice has a unique password (called a "private key") that lets her sign the message so that the network knows the message is coming from her and not from anyone else. Computers in the bitcoin network can easily confirm that Alice has 10 bitcoin to send because they each have a copy of the current database.

Importantly, at this point the transaction has only been proposed; no computer has updated

[5]This problem of how to digitally transfer an item of value directly is a particular case of a problem described in the computer science literature in the seminal paper "The Byzantine Generals Problem," published in 1982 (Leslie Lamport, Robert Shostak, and Marshall Pease, *ACM Transactions on Programming Languages and Systems* 4 [3]: 382–401). The paper defined the challenge as how to reach consensus in an unreliable system where no one party can trust the next—exactly the problem outlined in our example of two databases trying to come to consensus. The paper is available at http://people.cs.uchicago.edu/~shanlu/teaching/33100_wi15/papers/byz.pdf.

FIGURE 2. SIMPLIFIED DIAGRAM OF NETWORK STATUS PART 1: ALICE PROPOSES A TRANSACTION TO THE NETWORK



its copy of the ledger yet. Transactions are initially placed into what amounts to a waiting room, where they sit waiting confirmation. Because the transaction is only being proposed and not settled, the system can rapidly relay the message to ensure every participant is aware of it.

The process is shown in **Figure 2**. Alice and Bob are represented as the green circles. The orange rectangles represent sequentially updated copies of the ledger at the time Alice proposes her transaction to the network.

Alice is not alone, of course: While she is sending her message, others are sending messages, too, wanting to send their bitcoin to various recipients.

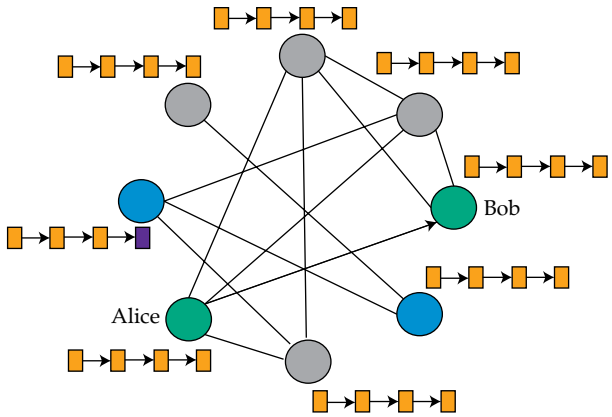
This is where a special participant in the network enters: "bitcoin miners." Miners are computers that are scattered around the world and form a critical part of the bitcoin network. Their job is to aggregate groups of valid new transactions, such as Alice's, and propose them for settlement. These groups of transactions are called "blocks," which is where the "block" in "blockchain" comes from. In Figure 3, the blue dots represent miners.

At any given time, thousands of these computers are competing with each other for the right to settle the next block. The competition involves solving a challenging mathematical puzzle, and miners can propose a new block only if they solve the current puzzle. Whoever finds the solution first is entitled to a reward, which consists of newly minted bitcoin and potentially transaction fees, which have been paid by the entity initiating the transaction.[6] The reward is significant: Each new block currently comes with a reward of 6.25 newly minted bitcoin, worth roughly $70,000 at the moment.[7] This payment is what incentivizes miners to perform the work necessary to verify transactions and maintain the database.

[6]Users who propose transactions, such as Alice, can append small fees to them to incentivize miners to settle their transaction ahead of other pending transactions. These fees are typically *de minimis*, though they can become significant if the network is busy.

[7]Data as of 30 September 2020, based on a closing price of $10,784, as reported at https://coinmarketcap.com.

FIGURE 3. SIMPLIFIED DIAGRAM OF NETWORK STATUS PART 2: A BITCOIN MINER BUILDS A BLOCK OF TRANSACTIONS THAT CONTAINS ALICE'S TRANSACTION



New blocks are settled on the bitcoin network roughly every 10 minutes, though the exact time depends on how quickly the puzzle is solved.[8]

This process is illustrated in **Figure 3**. Aside from Alice and Bob in green, the bitcoin miners are now represented as blue circles. The purple rectangle shows the updated ledger that includes a number of new transactions, including Alice's. For now, only one network participant (the miner who proposed the new block of transactions) can see the fully updated ledger; all other participants still only see the older blocks, which are depicted in orange.

Because the reward is significant, many miners compete to settle each block of transactions. Competing is expensive—by design, solving the puzzle takes significant computing power and burns a lot of energy—and knowing which of the thousands of miners will solve the puzzle first is impossible.

Once a miner *does* solve the puzzle, however, it can post the solution and propose a block of transactions to the network. The peculiar genius of the system is that although solving the mathematical puzzle is difficult and expensive, checking the result is trivially easy. And when a miner posts a solution and a block of transactions, other members of the network check the work. If the transactions are valid and the puzzle solution is correct, network participants update their copy of the database to reflect the new transactions. At that point, Alice's transaction is considered settled![9]

[8]The bitcoin blockchain's software automatically updates the difficulty of the puzzle roughly every two weeks, such that increases in the computer power focused on bitcoin mining does not alter the roughly every-10-minute cadence of new block production.

[9]In practice, many users wait for a small number of additional blocks (typically one to three, but sometimes as many as six) to settle before considering a transaction truly final.

One challenge a decentralized and distributed database, such as the bitcoin network, faces is that, because of communication delays, two miners could propose blocks of transactions at the same time without knowing about each other. You could imagine, for instance, a miner in Iceland and another in Japan proposing blocks at virtually the same time, before news of the other block could travel

Importantly, the competition to settle the next block of transactions depends on including the information from the previous block, which both provides the incentive for market participants to rapidly update their copy of the database and ensures that tampering with a settled block is very difficult. This "chaining together of blocks" is why this database architecture is called a "blockchain."

What if, you might be wondering, the unknown bitcoin miner submitting a block is a bad actor and proposes an invalid block of transactions that somehow benefits it? Or what if Alice herself is malicious, and she is trying to send the same 10 bitcoin to both Bob and Carol at the same time without anyone noticing?

Network participants examine each transaction in each proposed block and reject blocks with invalid transactions. Today, more than 40,000 computers[10] are independently verifying every single bitcoin transaction.[11] Because the work of validating transactions and ensuring that only valid transactions are settled is trivially easy for network participants and attempting to settle transactions is costly, the incentive to even try to defraud the system is minimal. This "consensus algorithm" is the heart of a blockchain network and arguably the most ingenious part of Satoshi Nakamoto's breakthrough.

This process is depicted in **Figure 4**. All network participants have now accepted the new block of transactions proposed (purple rectangle). As a result, their ledgers are updated and synchronized.

The most impressive feature of bitcoin's technical architecture is that it works. Ten years after this novel system design was first outlined by its anonymous author, the bitcoin blockchain has shown a track record of running and holding tens and even hundreds of billions of dollars of value securely and of processing only valid transactions, with nearly 100% uptime. The database has never been hacked and currently settles roughly the same value of transactions each year as PayPal,[12] all without a single employee or central organizing figure.

It is a true technical breakthrough—a significant advance in software and database design—and it is having a significant impact on the world.

around the world. In this situation, some miners might begin searching for additional blocks to add on to each of the chains, creating divergent databases.

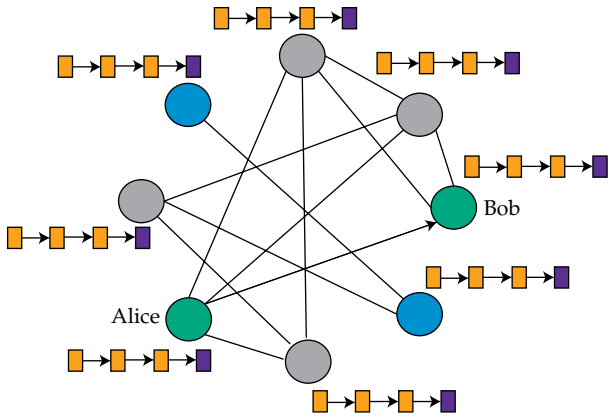
To solve this (rare) problem and ensure that databases return to a synchronous state, the bitcoin blockchain has a rule that the chain that has used the most computational power to solve for blocks is the valid chain. Because two divergent chains cannot continue to propose blocks at precisely the same pace, as multiple blocks pile up, one chain will inevitably emerge as the valid one, and all activity will focus on it. The likelihood of two divergent chains existing decreases with extreme rapidity as additional blocks are settled, such that after a very small number of blocks, users can be certain only one chain exists. A common analogy is to think of each block as a layer of amber around a fly: As time passes, the fly becomes buried deeper and deeper in computational effort and is, therefore, more difficult to tamper with.

[10]Luke Dashjr, a respected bitcoin core developer, regularly publishes an up-to-date and widely-cited estimate of the bitcoin network node count (i.e., the number of computers independently verifying each bitcoin transaction). As of 30 September 2020, this number was 46,056. The estimate can be retrieved at https://luke.dashjr.org/programs/bitcoin/files/charts/historical.html.

[11]For an excellent in-depth and technical view of how the bitcoin network shuns invalid transactions, we suggest the article "Bitcoin Miners Beware: Invalid Blocks Need Not Apply," written by pseudonymous crypto researcher StopAndDecrypt on 1 June 2018 and published on Medium (https://medium.com/hackernoon/bitcoin-miners-beware-invalid-blocks-need-not-apply-51c293ee278b).

[12]In the first half of 2020, the bitcoin network settled more than $358 billion in transactions (according to Coin Metrics), nearly comparable to PayPal's $412 billion (according to Statista).

FIGURE 4. SIMPLIFIED DIAGRAM OF NETWORK STATUS PART 3: ALL NETWORK PARTICIPANTS VALIDATE AND ACCEPT BLOCK PROPOSED BY MINER



Beyond the Technical Breakthrough: Bitcoin as a Novel Economic Phenomenon

Now that we have established how a blockchain works technically, the next question is, What impact might this new database architecture have on the world?

Answering that question is not easy. Attempting to do so is somewhat like trying to guess in the early 1990s how the internet would change the world. The internet clearly represented a new way to distribute information and could have major consequences, but moving from that to predicting that people would, for example, regularly use smartphones to rent out a stranger's house rather than staying in a hotel is a whole different matter.

Similarly, blockchains clearly represent a new way to transfer valuable assets and money, but moving from that to precise predictions of future applications is fraught.

Rather than attempting to answer this question with specificity, we will outline the fundamental, disruptive new capabilities blockchains offer and broadly define the three areas in which we believe those capabilities are likely to have an impact on the world.

Capability 1: Rapid, Low-Cost, 24/7 Settlement

The first disruptive capability has to do with settlement. As discussed, blockchains such as bitcoin provide a massive improvement over existing settlement paradigms.

Consider this transaction: On 12 April 2020, someone transferred 161,500 bitcoin—worth more than $1.1 billion at the time—in a single transaction. The transaction settled in 10 minutes, and the fee for processing the transaction was $0.68.[13]

Contrast that with an international money wire, which can be sent only during banking hours,

[13]Turner Wright, "Bitfinex Made a $1.1 Billion BTC Transaction for Only $0.68," Cointelegraph (13 April 2020). https://cointelegraph.com/news/bitfinex-made-a-11-billion-btc-transaction-for-only-068.

takes one to two days to settle, and has fees ranging from 1% to 8%.

The difference is startling.

An unmanaged software network with zero employees can settle a $1 billion-plus transaction in minutes, whereas the largest banks in the world take multiple days to move $5,000 abroad. In addition, bitcoin transactions can be sent at any time of day or night and from any location around the world to anywhere else.

This is true not just for isolated large transactions, either: Every day, users settle transactions on the bitcoin network with values as small as a penny, as well as ones measured in tens and even hundreds of millions of dollars. In the first half of 2020, the fees for bitcoin transactions amounted to just 0.019% of the volume transacted.[14]

These efficiency gains do not mean we are going to be buying coffee with crypto anytime soon; tax, price volatility, user experience, and basis-risk considerations make day-to-day consumer purchases with bitcoin unlikely today. But this kind of settlement speed represents a material improvement for many other types of transactions and use cases, including large transactions and transactions for which the current financial system charges very high fees (e.g., international remittance, wires). This is an area to watch.

Capability 2: The Creation of Scarcity and Property Rights in the Digital World

Perhaps the biggest breakthroughs that cryptoasset-powered blockchains have facilitated are the related concepts of digital scarcity and digital property rights.

Historically, the only way to "own" something online has been to have your ownership recorded by a trusted third party in a proprietary database. For instance, your broker keeps track of what stocks you own, your bank keeps track of what balances you own, video game companies keep track of in-game purchases, county clerk offices keep track of land titles, and so on.

Cryptoassets flip that system on its head.

Because the underlying blockchain database is available to everyone without being controlled by anyone, cryptoassets can provide ownership guarantees that were previously nonexistent in the digital world. In fact, one could argue that the ownership assurances blockchains offer are stronger than most of the ones we have in the physical world.

For instance, a key part of the software that created bitcoin guarantees that the total number of bitcoin will never be more than 21 million. Anyone can prove they own their bitcoin (or a fraction of a bitcoin) out of the eventual 21 million supply without any company or trusted intermediary having to say it is so. Also, the cryptography assures that no one can take that person's bitcoin away without his or her authorization.

Many people talk about bitcoin as "digital gold" specifically because it introduced the idea of digital scarcity to the world. A *New York Times* bestseller was even published with that name in 2016.[15]

Imagine someone trying to create digital gold before the bitcoin blockchain. This person

[14]Data from the public application programming interface provided by blockchain data provider Coin Metrics, accessed on 25 August 2020. Documentation is available at https://docs.coinmetrics.io/api/v2.

[15]Nathaniel Popper, *Digital Gold: Bitcoin and the Inside Story of the Misfits and Millionaires Trying to Reinvent Money* (New York: Harper, 2015).

would have needed a company—let's call it the "digital gold company"—that offered the same service bitcoin does. It would have created a certain amount of digital gold and then maintained a database of who owns what.

Who would trust this mythical company with real money? What would stop it from deciding at some point, if the venture became large enough, to create extra digital gold for its account or to increase the overall supply of this digital gold? What would prevent it from taking digital gold from users or from simply walking away with people's money?

A decentralized database solves this problem.

Digital gold, however, is not the only potential application for digital scarcity. A bustling corner of the crypto industry is what is known as nonfungible tokens (NFTs), which the gaming industry is exploring.

Imagine a video game that allows players to own an item, such as a special sword. What if you wanted to sell that sword to someone on eBay? How would they know you own it? How would you transfer it to them? The NFT vision is that players can prove they own a specific asset, can trade that asset with other players whenever they see fit, and might even do so outside the confines of the game.

Another example of experimentation with scarcity is the digital equivalent of traditional sports trading cards. One startup is working with the National Basketball Association (NBA) and the National Basketball Players Association to produce digital playing cards.[16] Oddly, in 2020, even though much of our lives takes place online, kids and collectors have not yet embraced digital playing cards. But without a blockchain, the scarcity value of an online card disappears: You could just copy and paste the image of a card you wanted and say you had it. With a blockchain, ownership can easily be proven or disproven.

Anticipating what creative entrepreneurs will devise to leverage the technological breakthrough of digital scarcity and digital property rights is difficult. But this is a powerful concept that provides a way of doing things that was not possible before—and another place to watch for innovation.

Capability 3: Digital Contracts ("Programmable Money")

The final advance worth considering is that cryptoasset-powered blockchains allow users to effectively program money with certain rules and conditions, as you would program any software. These digital "smart contracts" can be created, reviewed, and enforced easily, instantaneously, and with virtually no cost.

With money programmable like software, you can create transactions with such conditions as the following:

- Alice transfers cryptoasset X to Bob, but only after Carol agrees—which looks a lot like an escrow account.
- Alice transfers cryptoasset X to Bob, but only after a certain amount of time—which looks a lot like a trust.
- Alice sends cryptoasset X to Bob, but only if Carol wins the race; if Carol loses, Bob sends cryptoasset Y to Alice—which looks a lot like a contract.

Blockchains allow these and many more-complex transactions to be executed without the need for trusted intermediaries. In so doing, smart contracts aim to replace or augment

[16]Fred Wilson, "NBA Top Shot," AVC (6 August 2020). https://avc.com/2020/08/nba-top-shot-2/.

many of the core functions provided today by banks, lawyers, accountants, escrow agents, and notaries, albeit in a way that is cheaper, faster, more transparent, open to all participants, and available 24/7/365.

Like that of digital cash, this idea of smart contracts is not new. Smart contracts were introduced as a theoretical concept by cryptocurrency pioneer Nick Szabo in 1997 but were made possible in practice only after the emergence of cryptoasset-powered blockchains.[17]

The ability to program money with conditions and digital contracts is the third new capability we expect to lead to significant applications and economic impact.

PART II: UNDERSTANDING THE CRYPTO LANDSCAPE

Bitcoin is not the only cryptoasset. According to the popular data aggregator CoinMarketCap, more than 6,000 different cryptoassets exist, and many new ones are created each month. Although most of these assets are small, many are valued at more than $1 billion.[18]

The Bitwise 10 Large Cap Crypto Index is a market-cap-weighted index of the 10 largest cryptoassets, screened for liquidity, security, and other risks. It captures approximately 85% of the total market capitalization of the crypto market. **Figure 5** showcases the relative market capitalization of these leading assets.

In this section, we will survey the current cryptoasset landscape and ask three critical questions:

- Why does more than one cryptoasset exist?
- Does the existence of thousands of cryptoassets damage the "scarcity" of an asset such as bitcoin?
- Do you need a cryptoasset to have a blockchain?

Why Does More Than One Cryptoasset Exist?

Multiple cryptoassets exist and are thriving because their underlying blockchains are optimized for different uses.

The blockchain technology tied to each cryptoasset is simply software. Any two blockchains are similar types of software, but they can be programmed to serve very different uses. Consider this analogy: Both Microsoft and Oracle are software companies, but their software products are designed to do different things.

The impact of these optimizations is best explored by comparing bitcoin's blockchain with that of the next-largest cryptoassets.

Bitcoin vs. Ethereum

Bitcoin's blockchain—the first ever launched—is in certain ways simple. As a piece of software, it allows for only a very narrow set of types of transactions: You can program it to send, receive, or hold bitcoin and to set up very simple escrow- and trust-style accounts.

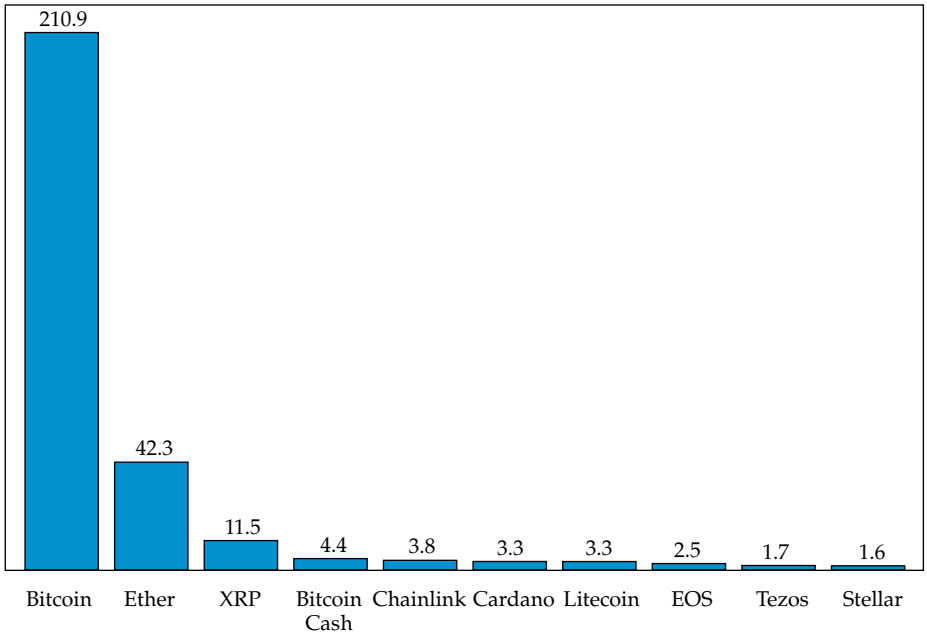
Ethereum, the second-largest cryptoasset by market cap,[19] was conceived in 2013 and launched in 2015 with the idea of expanding that list of capabilities. In fact, Ethereum's

[17]Nick Szabo, "Formalizing and Securing Relationships on Public Networks," *First Monday* 2 (1 September 1997). https://doi.org/10.5210/fm.v2i9.548.

[18]Data as of 30 September 2020 from CoinMarketCap.

[19]Data as of 30 September 2020 from Bitwise Asset Management.

FIGURE 5. CURRENT BITWISE 10 LARGE CAP CRYPTO INDEX CONSTITUENTS RANKED BY MARKET CAPITALIZATION (IN US$ BILLIONS)



Sources: Bitwise Asset Management with data from CoinMarketCap as of 11 October 2020.

developers designed it to be "Turing complete," a computer science term that means it can be programmed to do anything a general computer can do. By offering the ability to program any type of transaction, Ethereum has established itself as the platform of choice for the "programmable money" use case.[20] To date, people have replicated everything from collateralized loans to IPO-style fundraising efforts using Ethereum-based "smart contacts." People have even built fully functional decentralized asset exchanges, which rely on software-based automated-market-making programs to facilitate liquidity and have supported billions of dollars in crypto trades.

One might assume that this additional flexibility makes Ethereum a "better" blockchain than bitcoin, but this functionality comes at a cost. One core tenet of cybersecurity when programming software is to "limit the attack surface." In practice, for the crypto/blockchain space, this means that the simpler a blockchain is, the more secure the technology is. It is common sense: Just as a book is more likely to have a typo than a single sentence, a complex computer program is more likely to have a bug or vulnerability than a simple one.

Bitcoin's simplicity is part of what makes it extremely secure and what gives people confidence putting large sums of money into it—perfect for serving as "digital gold." Ethereum's flexibility and dynamism entail a level of technical risk that would be unacceptable for bitcoin

[20]Recently, Ethereum has gained particular traction in finance-specific applications, such as blockchain-enabled lending protocols, which has given rise to a new term: "decentralized finance," or "DeFi."

but that allows other interesting applications to flourish.

Bitcoin vs. XRP

XRP, also known as Ripple, is currently the third-largest cryptoasset.[21] It differentiates itself from bitcoin in an entirely different way from Ethereum.

Bitcoin is a fully decentralized blockchain, with instances of the database distributed around the world and maintained by thousands upon thousands of computers. The fully distributed nature of bitcoin offers great advantages: For instance, for any single government to disrupt, shut down, or harm the bitcoin blockchain would be very difficult because it is maintained in virtually every country around the world. Bitcoin is also truly censorship resistant and seizure resistant. No governmental or other entity can block bitcoin payments or seize bitcoin.

The flip side of this decentralization is that bitcoin is too slow for some use cases. The bitcoin blockchain can currently process only a handful of transactions per second, compared with more than 20,000 per second for a centralized payment network such as Visa's. Although researchers are working on ways to get around this limitation, it remains a significant restraint.

This restraint does not matter for bitcoin's primary use cases as a store of value or a tool to move large sums around the world with low fees, but it makes using bitcoin as a daily payment vehicle a challenge.

XRP and its underlying blockchain are designed specifically to support the payments use case. XRP's blockchain is maintained by a group of just 36 nodes, which work together to process transactions and maintain the blockchain's security. A single company, Ripple, controls the majority of the supply of the asset and maintains significant oversight of the ecosystem, including controlling 6 of the 36 nodes.

The advantage of this centralization is that the XRP blockchain is extremely fast, capable of processing transactions at a pace that matches Visa's. The downsides include that it is exposed to greater government oversight, that payments can be more easily censured or reversed, and that holdings of XRP are subject to possible seizure.

XRP would be a poor choice of blockchain for someone looking for digital gold. In contrast, XRP is a feasible blockchain if the goal is to process payments quickly, which means it might have applications in such fields as international remittances and corporate payments across borders, among others.

Other Assets

The aforementioned trade-offs—between security, programmability, and speed—are the three biggest trade-offs that blockchains must consider. And the aforementioned markets—digital gold, programmable money, and payments—are the three biggest markets that crypto is tackling today.

But other points of differentiation exist between blockchains and other use cases the industry is pursuing. These include the following:

- *Governance:* How should a blockchain handle software upgrades and settle disputes?
- *Development funding:* Should a centralized entity—such as a foundation—that is granted a large initial or ongoing share of a given cryptoasset be in place so that it can help develop the ecosystem surrounding that asset?

[21]Data as of 30 September 2020 from Bitwise Asset Management.

- *Privacy:* Should transactions on a blockchain be public, pseudonymous, or truly anonymous?
- *Consensus mechanism:* What is the best technical and incentive architecture to maintain a blockchain? And how should concerns about high energy use, database bloat, and similar issues be handled?
- *Specific use cases:* Should blockchains provide general capabilities, or should they focus on specific use cases?

Whatever the right priorities are, the natural tendency in the cryptoasset market is for the winners in each market to get bigger, because cryptoasset-powered blockchains are network effects systems. The larger the asset, the more liquid it is, the more development activity surrounds it, the more robust its regulatory framework will be, the more support it has from institutional custody and trading firms, the more feasible it is to use, and so on.

Despite this fact, however, the likelihood that a single cryptoasset will come to serve every market need seems low. Some degree of specialization typically exists even in network-effect businesses. For instance, in the realm of social networks, Facebook is used extensively for social connections, LinkedIn for work, WhatsApp for chatting, and so on. Something similar seems likely to emerge in the crypto space.

Does the Existence of Thousands of Cryptoassets Damage the "Scarcity" of an Asset Such as Bitcoin?

The other question people ask when learning about the great number of existing cryptoassets is whether their existence (and the potential future existence of an unlimited number of additional cryptoassets) threatens the scarcity value of a cryptoasset, such as bitcoin.

The answer is no. Just as a foreign country creating a currency does not affect the scarcity of the US dollar, given that the two currencies would not be fungible, a new cryptoasset is not fungible with existing ones simply because it is also a cryptoasset.

Consider that thousands of cryptoassets have launched since bitcoin's inception, but bitcoin's value has only increased. Dozens of "forks" of bitcoin have even been released—cryptoasset projects that copy and paste the original bitcoin code, change a relatively trivial feature, and issue a new version of the coin. These forks have such names as Bitcoin Cash, Bitcoin SV, Bitcoin 2, Bitcoin Nano, World Bitcoin, and Quantum Bitcoin. Although one or two forks have accrued meaningful value and seem to have staying power due to community interest and/or unique technical optimizations, most have amounted to virtually nothing.

What is important to understand is that the value of each cryptoasset-powered blockchain is less a patent-worthy secret technology and more the network that emerges around each one.

Bitcoin, for instance, is a well-known global brand that trades on exchanges in countries around the world. It is supported by a robust network of custodians, liquidity providers, and developers; is integrated with dozens of apps; and is coveted by millions of investors. The bitcoin blockchain is secured by the largest network of computing power in the world, a network that is many times more powerful than the world's largest supercomputer. This network is supported by an industry of "bitcoin mining companies" and chip manufacturers that exist

specifically to maintain and strengthen the network. There are bitcoin funds, efforts to launch bitcoin exchange-traded funds (ETFs), payment tools that focus on bitcoin, and so on.

In comparison, any new cryptoasset or blockchain has none of that: no liquidity, no computers securing the blockchain, no clear regulatory structure, and no global brand.

As an analogy, duplicating the software code that powers Facebook would be relatively easy, but recreating the network that makes it one of the most valuable companies in the world would be extremely difficult. Similarly, cryptoasset-powered blockchains are proprietary networks that form around nonproprietary software.

Do You Need a Cryptoasset to Have a Blockchain?

A final common question that arises when studying blockchains is, Why not just create a blockchain without a cryptoasset?

Many people understand the value that blockchains bring to the world, but they are uncomfortable with the idea of an independent cryptoasset, such as bitcoin, and its accompanying high levels of volatility or with the concept of a decentralized network that might be difficult to regulate or control.

Can you get the advantages of a blockchain without the cryptoasset?

At the heart of the question about blockchains versus cryptoassets is the issue of "public, decentralized blockchains" versus "private, centralized blockchains."

Public, decentralized blockchains, such as bitcoin, require a cryptoasset to function, in part because the issuance of that cryptoasset provides the economic incentive for miners to maintain the network.[22]

You can, however, have a "private blockchain" that uses much of the same distributed database architecture components as bitcoin but that has a company that sets up, maintains, and controls the network and provides the economic incentives for it to function. In a private blockchain, the company or entity in charge decides who gets to participate in the database, can block or reverse transactions, can determine what privileges different members get, can rewrite the rules, can shut the blockchain down, and so on.

In between these two extremes, you have shades of gray. For instance, some cryptoasset-driven networks are relatively centralized, such as Ripple, where transactions are processed by a limited set of entities, and most of the asset is owned by one company. Similarly, other blockchain networks are somewhat decentralized but still privately guided, such as the Facebook-associated Libra blockchain, which is managed by a consortium of dozens of members.

The variation in the level of centralization—from decentralized to more centralized to privately operated—is in many ways similar to the internet.

The internet we typically use today is an open, decentralized internet: No one owns it, and

[22]As discussed, many cryptoasset-enabled blockchains, including bitcoin, allow users who want to see transactions prioritized can append a "tip" or "fee" to their proposed transactions. In practice, however, transaction fees represent a tiny fraction of the mining reward. They would likely be insufficient at a network's inception to allow the network to function securely. Over very long periods of time, as a cryptoasset-enabled blockchain matures, it might be able to transition to a fee-powered model, but to date, the only large-scale successes have used new cryptoasset rewards to jump-start the network's growth and to incent miners to secure the network in its early days.

virtually anyone can create a website and interact with it. In this sense, the internet is like bitcoin or any other cryptoasset-driven blockchain database.

But privately run, corporate "intranets" that can be accessed only by certain people also exist. Your employer, for instance, might have an intranet whose content can be updated only by the firm's human resources department and viewed only by the company's employees.

In between are shades of gray: The Chinese internet, for instance, is one such system, with censorship and central control but a fair degree of discretion within those constraints.

So which system will win?

To date, by far the most exciting advances and new capabilities—such as digital gold and programmable money—have emerged from public blockchains powered by cryptoassets. Cryptoasset-powered blockchains, such as the bitcoin network, are the blockchains that have advanced such entirely new concepts as "digital scarcity" into the world and have garnered the attention of thousands of leading technologists, entrepreneurs, investors, and even innovative corporates. These cryptoasset-powered blockchains have grown from a proof of concept to an asset class valued at more than $350 billion in little more than a decade.

Surely, opportunities will arise for companies to create private blockchain-style databases to reduce back-office costs by a few percentage points or to increase transparency in supply chains, and significant ongoing efforts are being made by governments to iterate on fiat money by leveraging blockchain's advances to develop "central bank digital currencies." But these advances are incremental, rather than fundamental. They do not introduce entirely new capabilities into the world; rather, they enhance the functionality of existing systems in certain ways, while degrading them in others.

As in the early days of the internet, the public blockchain space can feel bizarre and even hazardous for the unversed. And again similar to the internet, the disruptive possibilities created by public blockchains have opened up windows for fraud and bad actors in its early years. But only public blockchains advance fundamental breakthroughs, such as digital scarcity, and in our opinion, this is likely the area where the largest leaps forward will happen.

We will focus on the investment opportunity provided by the cryptoassets that power public blockchains in the remainder of this document.

PART III: CRYPTO AS AN INVESTMENT OPPORTUNITY

As of 30 September 2020, bitcoin was trading for $10,784.[23] Considering the current circulating supply of approximately 18.5 million bitcoin,[24] this would imply a total market capitalization of $200 billion.

Is that a lot or a little?

The question of how to appropriately value cryptoassets is one of the most complex, challenging, and disagreed-on aspects of the crypto-market. This section will discuss why we believe the cryptoasset valuation question will remain open for a while and how investors can think about this issue.

We start with a brief but critical examination of the five most widely used cryptoasset valuation

[23]Data as of 30 September 2020 from CoinMarketCap.

[24]New bitcoins are issued each day. Although the total amount of bitcoin that will ever be issued is 21 million, roughly 18.5 million have been issued to date. New bitcoin issuance will continue until approximately 2140.

techniques and end with a proposal for how to consider the issue holistically.

Approach 1: Total Addressable Market

The most popular approach to value cryptoassets is to estimate their addressable markets and compare that estimate with their current market capitalization.

For instance, many people believe that bitcoin is competing with gold as a nonsovereign store of value. At current prices of roughly $2,000 per ounce, the total stock of gold held above ground amounts to approximately $13 trillion.

As we have noted, the maximum number of bitcoin that will ever be available is 21 million. And so, the thinking goes that if bitcoin matches gold as a nonsovereign store of value, each bitcoin would be worth roughly $620,000 (on a fully diluted basis); if bitcoin captures 10% of the gold market, each bitcoin would be worth roughly $62,000; and so on. With its current market capitalization of roughly $200 billion,[25] bitcoin captures less than 2% of the value stored in gold.

The clear advantage of this approach is its simplicity. It is easy to understand and provides a solid framework for considering order-of-magnitude comparisons between cryptoassets and the markets they address.

This approach also makes introducing additional use cases easy. For example, one can consider that bitcoin is going after not only the gold market but also the entire "store-of-value" market. In that case, one can add offshore assets, parts of the real estate market, art, negative-yielding bonds, and other potential markets to the mix. This would increase bitcoin's target market by multiple tens of trillions of dollars.

However, while directionally helpful, this type of back-of-the-napkin valuation exercise falls short in many ways. To start, it provides at best a rough estimate of the order of magnitude of value that a cryptoasset might attain. It also supposes that bitcoin will create a new store-of-value market, above and beyond the existing gold market.

Additionally, beyond bitcoin and other store-of-value use cases, comparative valuation metrics hold little meaning. If Ethereum is going after the programmable money use case and competing with the broader financial industry, how do you estimate the size of that market? Even for the payments use case, this calculation is significantly challenging.

Approach 2: The Equation of Exchange (*MV = PQ*)

A widely discussed alternative valuation model was proposed by Chris Burniske, a crypto researcher and partner at the venture capital firm Placeholder Ventures, and Jack Tatar, managing partner of Doyle Capital, in a book called *Cryptoassets: The Innovative Investor's Guide to Bitcoin and Beyond*.[26]

Burniske and Tatar's framework is widely referred to by the monetary equation of exchange that drives its calculation:

$$MV = PQ.$$

The equation is borrowed from traditional models of valuing currencies and is based on the assumption that a currency's value is related

[25]Data as of 30 September 2020 from Bitwise Asset Management.

[26]Chris Burniske and Jack Tatar, *Cryptoassets: The Innovative Investor's Guide to Bitcoin and Beyond* (New York: McGraw-Hill Education, 2017).

TABLE 1. EQUATION OF EXCHANGE TERMS IN MONETARY ECONOMICS AND CRYPTOASSET VALUATION

Term	Meaning in Monetary Economics	Meaning in Cryptoasset Valuation
M	Total money supply	Cryptoasset market capitalization
V	Velocity: Average frequency with which a unit of money is spent	Velocity: Average frequency with which a unit of the cryptoasset is spent
P	Price of goods and services	The average price of transactions executed in the period studied
Q	Quantity of goods and services	Number of transactions executed in the period studied

to the size of the market it supports and to its velocity as it moves through that market. The definitions of *M*, *V*, *P*, and *Q* in both traditional monetary economics and cryptoasset markets are shown in **Table 1**.

These numbers can be estimated for some point in the future for a mature market and then discounted into present value.

As an easy example using round numbers, let us assume bitcoin will process 100 billion transactions (*Q*) of $100 each (*P*) per year. Then $P \times Q$ = 100 billion × $100 = $10 trillion per year. If on top of that we assume that bitcoin has a velocity of 5 (in other words, on average, one bitcoin changes hands five times per year), we arrive at a potential market capitalization of $10 trillion per year/5 per year = $2 trillion. If we divide this number by the fully diluted amount of bitcoin outstanding (21 million), it yields a price target of $2 trillion/21 million, or $95,238 per bitcoin. If we assume further that this level will be achieved in five years, we can discount this amount by an appropriate rate and arrive at an estimated present value.

One important challenge with this approach is that it requires estimating velocity, which is notoriously hard to do—even for a stable currency such as the US dollar—and velocity has historically varied significantly over time. According to data from the Federal Reserve,[27] one key measure of money velocity (MZM)[28] has ranged between 0.9 and 3.5 over the past 30 years; cryptoasset velocity is likely to vary more. Small changes in this estimate can lead to very large changes in proposed valuations.

Approach 3: Valuing Cryptoassets as a Network

A third approach to valuing cryptoassets is borrowed from "Metcalfe's law," a popular theory in technology that states that the value of a network is proportional to the square of the number of participants. If you consider a social network, such as Facebook, Instagram, or LinkedIn, for instance, its value when it has a single user is zero. If, however, a second user is added, the network becomes valuable. As more users are added, the network's value grows.

A key part of Metcalfe's law is that the value of the network is not linearly related to the number

[27]Federal Reserve Bank of St. Louis, "Velocity of MZM Money Stock." https://fred.stlouisfed.org/series/MZMV.
[28]MZM stands for "money at zero maturity."

of users but is instead related by a square function. In other words, if the value of a network of two users is expressed as "4" (2 squared), the value of a network with four users is 16 (4 squared)—four times as large.

Metcalfe's law has been used to value social networks with some degree of accuracy.

Ken Alabi first proposed applying Metcalfe's law to the valuation of cryptoassets in his 2017 paper "Digital Blockchain Networks Appear to be Following Metcalfe's Law."[29] Using the number of active daily users participating in the network, Alabi showed that the valuation differences between certain cryptoassets (he used bitcoin, Ethereum, and Dash) can be explained with a high degree of accuracy.

The Metcalfe valuation method makes intuitive sense, given that daily active users are a proxy for interest in and adoption of a cryptocurrency. Among its key limitations is that it is appropriate only for relative valuations between cryptoassets or for proxying current valuations on the basis of historical analogs. Another potential drawback is that it gives equal weight to each participant, which is less true in financial settings than in advertising-driven social networks. For example, the decision by Paul Tudor Jones II in May 2020 to allocate 2% of his portfolio in bitcoin (and to promote that allocation heavily in his investor letter)[30] is exponentially more important for valuation purposes than a new retail client at Coinbase buying her first $100 of bitcoin.

On top of that, given the large historical volatility of cryptoassets—bitcoin, for instance, has had six bear markets of more than 70% in its history—the choice of the starting point can have a dramatic impact on the suggestion for current valuations.

Approach 4: Cost of Production Valuation

The "cost of production" valuation thesis was first proposed by Adam Hayes in 2015[31] and has been expanded upon by multiple researchers since.

The theory holds that crypto, just like any commodity, is subject to traditional pricing challenges on the supply side. Crypto miners—the computers that process transactions and are rewarded with the underlying cryptoasset—spend fiat money to produce each marginal cryptoasset, through both energy and hardware expenditures.

Hayes and others suggest that, viewing bitcoin as a commodity and according to traditional microeconomic theory, the cost of producing each marginal bitcoin should align with the price of that bitcoin. After all, if bitcoin mining were to become unprofitable, miners could simply turn their attention to another cryptoasset or exit the market altogether. As a result, the value of each bitcoin can be estimated by examining the marginal cost of mining (specifically, the electricity burned in running the computations as part of mining) versus the expected yield of new bitcoin.

Empirical backtesting shows a relatively strong alignment between bitcoin's price and the marginal cost of production, lending some

[29]Ken Alabi, "Digital Blockchain Networks Appear to be Following Metcalfe's Law," *Electronic Commerce Research and Applications* 24 (July/August 2017): 23–29. www.sciencedirect.com/science/article/abs/pii/S1567422317300480.

[30]Erik Schatzker, "Paul Tudor Jones Buys Bitcoin as a Hedge against Inflation," Bloomberg (7 May 2020). www.bloomberg.com/news/articles/2020-05-07/paul-tudor-jones-buys-bitcoin-says-he-s-reminded-of-gold-in-70s.

[31]Adam Hayes, "A Cost of Production Model for Bitcoin," working paper (New School for Social Research, March 2015). www.economicpolicyresearch.org/econ/2015/NSSR_WP_052015.pdf.

credence (though no directional causality) to this approach.

The "cost of production" analysis, however, involves some significant challenges. For one, it is circular in its reasoning because the decision made by miners to enter or exit the market is driven by the cryptoasset's price. Using two necessarily cointegrated variables to value one another has very little predictive or explanatory power.

The model also fails to account for or explain the massive short-term volatility of bitcoin's price or the fact that bitcoin's mining difficulty is programmatically adjusted on a biweekly basis depending on the level of effort miners have focused on it.

Beyond that, many cryptoassets use a consensus mechanism different from that of bitcoin, one that does not lend itself to this kind of analysis. In proof-of-stake systems, for instance, little or no energy is consumed in mining; instead, miners lock up assets in escrow in exchange for securing the network. For these markets, no direct concept of the cost of production exists.

In the end, although cost of production has aligned roughly with prices for some cryptoassets in the past, the cause-and-effect relationship is not clear and its predictive value for the future is very much in question.

Approach 5: Stock-to-Flow Model

A fifth approach, dubbed the "stock-to-flow" model, was first published in the 2019 paper "Modeling Bitcoin Value with Scarcity" by PlanB, a pseudonymous crypto quant researcher.[32]

The stock-to-flow model states that bitcoin's price is a reflection of its scarcity and that scarcity can be measured by the stock-to-flow ratio—the relationship between the extant value of bitcoin and the amount of new bitcoin being produced each year. The paper showed that the price of bitcoin has historically been tightly correlated with increasing scarcity expressed by the stock-to-flow model.

In 2020, PlanB published a new iteration of this model focused on the relationship of the stock-to-flow ratios of bitcoin and other stores of value, such as gold and silver.[33] This new version also accounted for state transitions, or different evolutionary stages in bitcoin's monetization process.

The stock-to-flow model is intended to apply only to bitcoin and is appealing to some who see scarcity as the dominating characteristic of hard monetary assets.[34]

We are skeptical of this approach because it appears to conflate correlation with causation. It is true that one of bitcoin's strengths is its strictly limited supply, but assuming that this is the only factor driving its price is an overreach. It is also overly convenient for crypto bulls because bitcoin's stock-to-flow ratio is programmatically increasing over time and, therefore, "predicts" in this model a perpetually rising price for the asset.

[32]PlanB, "Modeling Bitcoin Value with Scarcity," Medium (22 March 2019). https://medium.com/@100trillionUSD/modeling-bitcoins-value-with-scarcity-91fa0fc03e25.

[33]PlanB, "Bitcoin Stock-to-Flow Cross Asset Model," Medium (27 April 2019). https://medium.com/@100trillionUSD/bitcoin-stock-to-flow-cross-asset-model-50d260feed12.

[34]Economist Saifedean Ammous is among those who have advanced the idea that assets with a strictly capped supply ("hard money") will, over the long run, dominate other competing monetary assets. His book, *The Bitcoin Standard: The Decentralized Alternative to Central Banking* (Hoboken, NJ: John Wiley & Sons, 2018), is a strong introduction to bitcoin from a monetary perspective.

Also, given the programmatic nature of the model, many have pointed out that the market (even if only modestly efficient) should price in the impact of bitcoin's future stock-to-flow ratio, impounding future value today.[35] Though widely discussed in some crypto circles, the stock-to-flow ratio is not seriously considered by academic researchers.

Conclusion

The unfortunate reality is that none of the proposed valuation models are as sound or academically defensible as traditional discounted cash flow analysis is for equities or interest and credit models are for debt. This should not come as a surprise. Cryptoassets are more similar to commodities or currencies than to cash-flow-producing instruments, such as equities or debt, and valuation frameworks for commodities and currencies are challenging. Cryptoassets add another wrinkle in that they are still extremely early in their development, and we are still uncovering the utility that these assets can provide.

New York University professor of finance Aswath Damodaran has compared cryptoasset valuations with those traditional commodities and currencies. He has noted, "Not everything can be valued, but almost everything can be priced,"[36] pointing out that "cash generating assets can be both valued and priced, commodities can be priced much more easily than valued, and currencies and collectibles can only be priced."[37] Cryptoassets fit somewhere between the second and third buckets.

Commodities, of course, are analyzed from a supply-and-demand perspective, and this is where cryptoassets might have an edge. Imagine that an investor could have real-time access to a transparent ledger that contains a record of every instance in which a single barrel of oil changes hands. Although this is not feasible for oil, it is easily at hand for cryptoassets. In fact, a nascent but burgeoning field of analysis combines data from what is happening in the blockchain (on-chain data) with market data–like prices and volumes (off-chain data). We are optimistic that more-refined modeling techniques looking at these data wells will bear fruit in the years to come.[38]

In the end, most investors approach cryptoassets as some combination of commodity, currency, and early-stage venture capital investment, borrowing techniques from each approach and emphasizing long-term holding periods. This makes precision challenging but might be enough to justify or reject the idea of adding a cryptoasset allocation to a portfolio.

We examine the impact of such an allocation in the next section.

PART IV: CRYPTO IN A PORTFOLIO SETTING

Ultimately, investors arrive at this question: What role, if any, should cryptoassets play in an institutional portfolio?

In this section, we will attempt to answer that question in four steps:

[35]Nic Carter, "An Introduction to the Efficient Market Hypothesis for Bitcoiners," Medium (4 January 2020). https://medium.com/@nic__carter/an-introduction-to-the-efficient-market-hypothesis-for-bitcoiners-ed7e90be7c0d.

[36]Aswath Damodaran, "The Bitcoin Boom: Asset, Currency, Commodity or Collectible?" *Musings on Markets* (24 October 2017).

[37]Damodaran, "The Bitcoin Boom."

[38]An in-depth look at these (still incipient and imperfect) metrics is beyond the scope of this study. A good summary can be found in "Cryptoasset Valuation Research Primer, Part 2," produced by the blockchain data analytics firm Coin Metrics and available at https://coinmetrics.io/coin-metrics-state-of-the-network-issue-40-cryptoasset-valuation-research-primer-part-2/.

1. *Bitcoin's historical performance characteristics:* First, we will examine the historical performance of bitcoin, the cryptoasset with the longest track record (dating back to 2010).
2. *The performance characteristics of non-bitcoin cryptoassets:* Second, we will examine the performance of non-bitcoin cryptoassets and consider how those returns compare with bitcoin's.
3. *The impact of crypto on a diversified portfolio:* Third, we will examine the historical impact of adding crypto to a traditional diversified portfolio of stocks and bonds and consider key decision points, such as rebalancing frequency and position sizing.
4. *The future for cryptoasset returns:* Finally, we will consider whether crypto's historical performance is likely to persist.

Bitcoin's Historical Performance Characteristics

Bitcoin was the first cryptoasset, launching in 2009 and with public trading data available starting in mid-2010. Since bitcoin's launch, its performance has been characterized by three main attributes: high returns, high volatility (including sustained bull and bear markets), and low correlations with traditional assets.

High Returns

The first publicly available trading data for bitcoin dates back to 17 July 2010, when bitcoin was trading for just $0.05. As of 30 September 2020, bitcoin was trading at roughly $10,784, meaning a $10,000 investment in bitcoin on its first trading day would today be worth $2.2 billion.[39]

Long-term charts of bitcoin's price show this massive run-up and are often presented in log form so that the early returns can be differentiated, as shown in **Figure 6**.

Log charts can be difficult to interpret, so perhaps the easiest way to understand the evolution of bitcoin's returns is by considering them on a segmented calendar basis, as shown in **Table 2**.

As the data show, bitcoin has risen in 9 of the 11 calendar years since it has had traded prices and has posted triple-digit or greater returns in 6 of those years. These high returns make bitcoin the best-performing investment of the past decade and, to this point, arguably the best-performing publicly available investment opportunity of all time.

High Volatility

These high returns, however, have been accompanied by high volatility, whether measured on an intraday, daily, annual, or peak-to-trough basis. As Table 2 shows, bitcoin has experienced 15 negative-return quarters since its inception, along with two negative years, including 2018's 73.71% pullback.

Moving away from segmented calendar periods, bitcoin's price has gone through six different peak-to-trough drawdowns of more than 70%. The most major pullback occurred after bitcoin hit its all-time daily closing price of $19,396 on 16 December 2017. From that point, the price of bitcoin retreated rapidly until bottoming on 14 December 2018, when it traded for $3,177, an 84% drop.[40]

Beyond large bear markets, bitcoin has also experienced high intraday and day-to-day volatility. **Figure 7** compares the volatility

[39]Data as of 30 September 2020 from CoinMarketCap.

[40]Data from CoinMarketCap.

FIGURE 6. BITCOIN SPOT PRICE IN US DOLLARS (LOG SCALE), 17 JULY 2020–30 SEPTEMBER 2020

Source: Bitwise Asset Management.

(measured as rolling 90-day standard deviation of daily returns, on an annualized basis) of bitcoin against other major risky asset classes, including stocks (US large cap, US small cap, and emerging markets), corporate bonds (investment grade and high yield), commodities (a diversified basket and gold), and emerging market currencies. Although bitcoin's volatility is trending down and generally making lower peaks over time, it was still substantially above the volatility of all other assets presented here as of 30 September 2020.

Low Correlations with Traditional Assets

The final distinguishing characteristic of bitcoin's historical returns is that they have exhibited consistently low correlations with the returns of all other major assets. **Figure 8** compares the 90-day rolling correlations between bitcoin and the same major risky asset classes mentioned earlier, since 2017. The light green band highlights correlation levels between –0.25 and 0.25, which we consider small, and the dark green band highlights the range between –0.10 and 0.10, which we consider negligible.

As Figure 8 shows, correlations have historically been *de minimis*. They did increase, however, during the coronavirus-related market crisis in the spring of 2020, though they generally remained below 0.5 (with a resulting R^2 of 0.25 or less).

The general lack of correlation should not be surprising. Bitcoin remains an early-stage investment opportunity, and the core drivers of bitcoin's value are distinct from the core drivers of other assets. Equities, for example,

TABLE 2. BITCOIN'S QUARTERLY AND FULL-YEAR RETURNS, 17 JULY 2010–30 SEPTEMBER 2020

Year	Q1	Q2	Q3	Q4	FY
2010			25.03%	384.65%	505.94%
2011	161.54%	1,952.74%	−68.08	−8.16	1,473.76
2012	4.03	36.53	84.59	9.12	186.08
2013	604.58	2.23	43.02	447.24	5,537.40
2014	−40.31	41.03	−39.58	−16.92	−57.74
2015	−24.00	7.55	−10.18	82.17	33.74
2016	−3.33	61.73	−9.25	58.44	124.81
2017	11.48	127.63	77.29	222.10	1,349.04
2018	−50.67	−7.69	3.40	−44.17	−73.71
2019	11.14	174.40	−26.28	−13.74	93.95
2020	−9.36	41.12	17.21		49.93

Note: Returns shown only for full quarters.

Source: Bitwise Asset Management.

are primarily driven by corporate profits, economic growth, interest rates, and tax policy. Bitcoin is driven by market adoption, network security, liquidity, inflation risks, supply changes, regulatory developments, technological developments, and other factors.

Expecting bitcoin's correlation with traditional assets to increase over time is reasonable, particularly for those assets (such as gold) that might play a similar role in investor portfolios. Indeed, correlations today are higher than they have been in the past, but given the diverse drivers of returns, the likelihood of a significant increase in correlation seems low.

The Performance Characteristics of Non-Bitcoin Cryptoassets

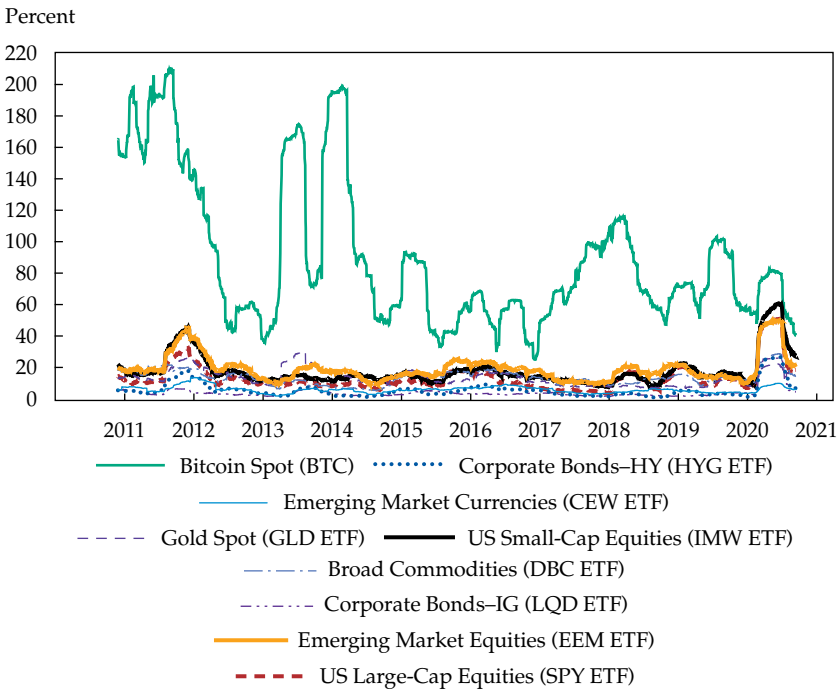
Bitcoin is just one of thousands of different cryptoassets that exist today. Although the market is very top-heavy—bitcoin alone accounts for almost 60% of the total market capitalization of the space, and the top 10 cryptoassets account for more than 80% of the total market capitalization[41]—many significant assets have market capitalizations measured in the billions or hundreds of millions of dollars.

Figure 9 shows how bitcoin's dominance of the total market capitalization of the space remains high, though it has generally trended down over time.

Although most cryptoassets rely on the same basic technology architecture as bitcoin, their blockchains are often optimized in different ways for different use cases, as discussed earlier. As a result, they have historically exhibited different returns, albeit with strong overall correlations.

[41]Data as of 30 September 2020 from Bitwise Asset Management and CoinMarketCap.

FIGURE 7. VOLATILITY OF BITCOIN VS. SELECT ASSET CLASSES (ANNUALIZED 90-DAY ROLLING STANDARD DEVIATION OF DAILY RETURNS), 20 JULY 2010–30 SEPTEMBER 2020



Notes: The price of bitcoin spot is calculated by Bitwise Asset Management from select exchanges considered to have real volume. "Broad Commodities" refers to the Invesco DB Commodity Index Tracking ETF (DBC). "Corporate Bonds–HY" refers to the iShares iBoxx $ High Yield Corporate Bond ETF (HYG). "Corporate Bonds–IG" refers to the iShares iBoxx $ Investment Grade Corporate Bond ETF (LQD). "Emerging Market Currencies" refers to the WisdomTree Emerging Currency Strategy Fund (CEW). "Emerging Market Equities" refers to the iShares MSCI Emerging Markets ETF (EEM). "Gold Spot" refers to the SPDR Gold Trust ETF (GLD). "US Large-Cap Equities" refers to the SPDR S&P 500 Trust ETF (SPY). "US Small-Cap Equities" refers to the iShares Russell 2000 ETF (IMW).

Sources: Bitwise Asset Management with data from IEXCloud.

The Correlation of Large-Cap Cryptoassets

Individual cryptoassets have historically exhibited correlations that are akin to the correlations exhibited by individual equities within the same market sector.

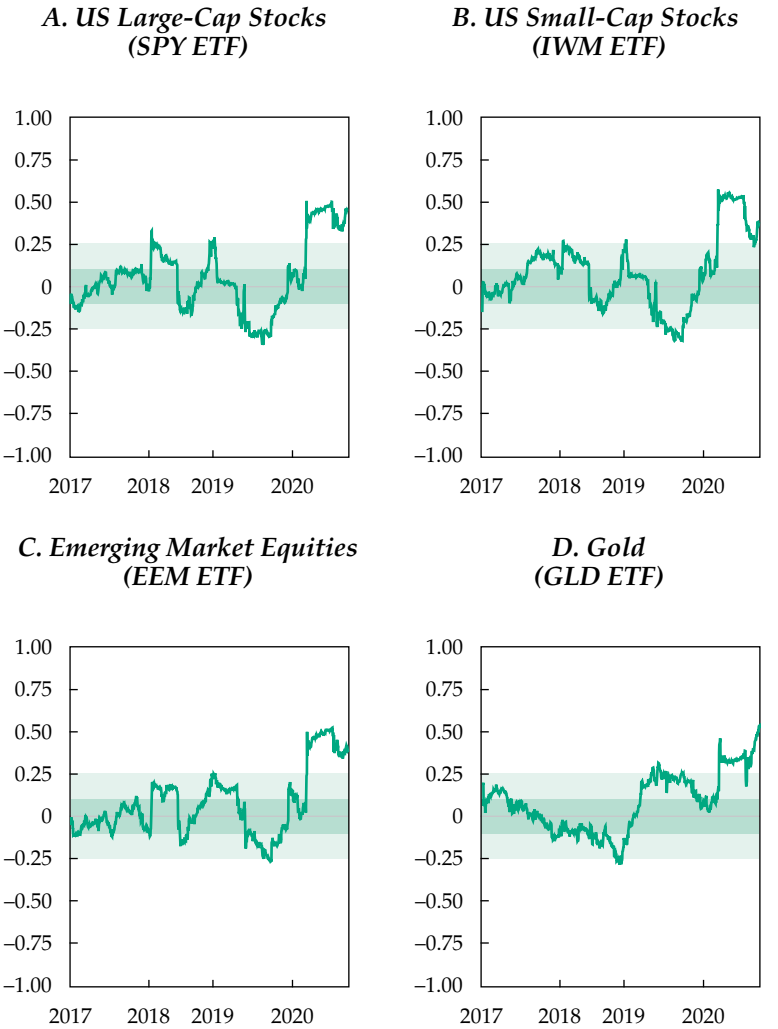
The charts in **Figure 10** compare the correlations (on a 90-day rolling basis) of bitcoin (the largest cryptoasset) with the next nine largest cryptoassets and of Berkshire Hathaway (the largest financial stock by market capitalization) with the next nine largest financial stocks held by the largest financials ETF, the Financial Select Sector SPDR Fund.

The similarity in correlations between competing large-cap cryptoassets and competing

large-cap financial stocks makes sense. Crypto, as an asset class, is affected by large factors, including evolving regulation, emerging education, liquidity, and new entrants, just as financial stocks are buffeted by their own macro factors, such as interest rates and economic growth.

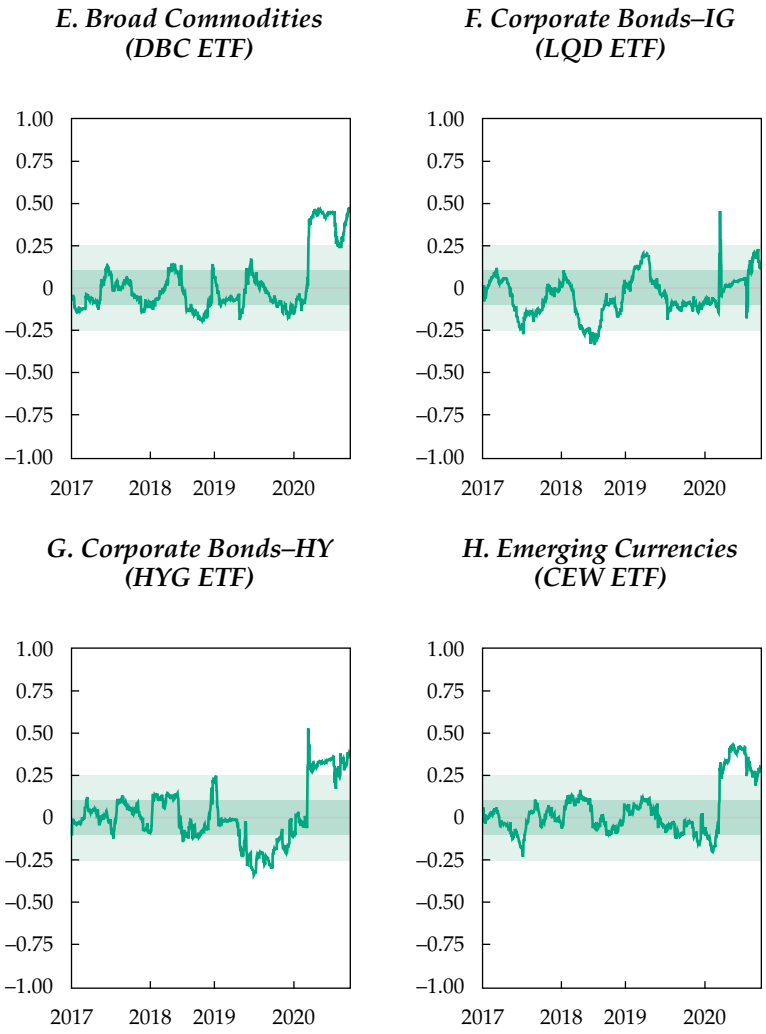
That said, the numerically high correlations between cryptoassets do not adequately depict the widely divergent long-term returns delivered by those assets over time.

FIGURE 8. ROLLING 90-DAY CORRELATION OF DAILY RETURNS BETWEEN BITCOIN AND OTHER MAJOR RISKY ASSET CLASSES, 1 JANUARY 2017–30 SEPTEMBER 2020



(continued)

FIGURE 8. ROLLING 90-DAY CORRELATION OF DAILY RETURNS BETWEEN BITCOIN AND OTHER MAJOR RISKY ASSET CLASSES, 1 JANUARY 2017–30 SEPTEMBER 2020 *(CONTINUED)*



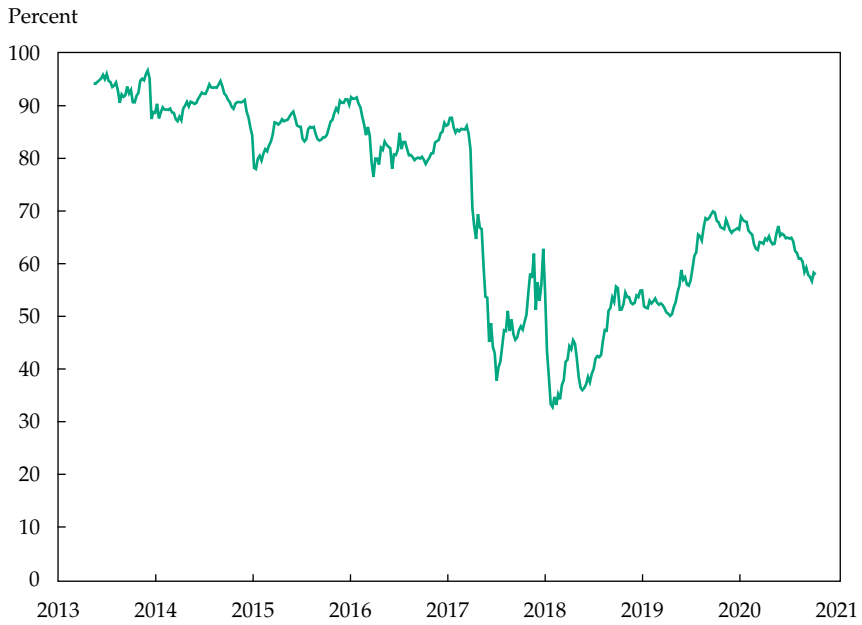
Note: See notes to Figure 7.

Sources: Bitwise Asset Management with data from IEXCloud.

The High Dispersion of Large-Cap Cryptoasset Returns over Time

Figure 11 borrows the familiar "Callan chart" format to show the monthly historical dispersion of returns for the 10 largest cryptoassets as of 30 September 2020. The difference between the best- and worst-performing cryptoassets among the top 10 in any given month averaged 59.3% over the past 12 months. Additionally, serial correlation between the stacked rank of

FIGURE 9. BITCOIN MARKET CAPITALIZATION AS A PERCENTAGE OF TOTAL CRYPTOMARKET MARKET CAPITALIZATION (WEEKLY DATA), 29 APRIL 2013–28 SEPTEMBER 2020



Sources: Bitwise Asset Management with data from CoinMarketCap.

performance of the various cryptoassets has been relatively low.

One way of considering the long-term impact of this dispersion of returns is by comparing the returns of a market-cap-weighted index of leading cryptoassets with the returns of bitcoin alone.

The Bitwise 10 Large Cap Crypto Index is a market-cap-weighted index of the 10 largest cryptoassets. The index was used by Cambridge Associates in its watershed report[42] on the space and is one of the most popular indexes for benchmarking the asset class.[43] From the index's base date of 1 January 2017 through 30 September 2020, the index had returns of 1,078%, versus 1,012% for bitcoin alone, as shown in **Figure 12**.[44] On a year-to-date basis through the same end date, the index returned 56.1%, versus 48.4% for bitcoin alone. Of course, periods of underperformance were seen, too:

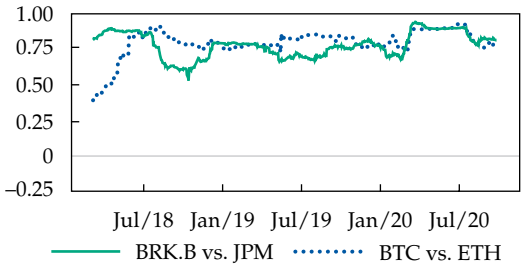
[42]Marcos Veremis, Alex Devnew, Michael Armstrong, and Dan Day, "Cryptoassets: Venture into the Unknown," Cambridge Associates (February 2019). www.cambridgeassociates.com/insight/cryptoassets-venture-into-the-unknown/.

[43]Matt Hougan and David Lawant serve on the Bitwise Crypto Index Committee, which governs the production of the index.

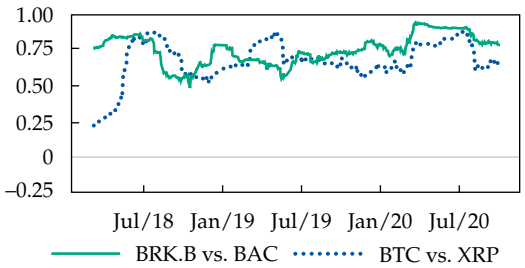
[44]The Bitwise 10 Large Cap Crypto Index's base date is 1 January 2017. Its inception date is 1 October 2017. Data from before 1 October 2017 are backtested data. Backtesting is performed by retroactively applying a financial model or index-weighting methodology to the historical data to obtain returns. Index returns are hypothetical returns that do not represent any particular investment and do not include transaction or tax-related costs.

FIGURE 10. ROLLING 90-DAY CORRELATIONS BETWEEN BITCOIN AND OTHER TOP 10 CONSTITUENTS IN THE BITWISE 10 INDEX AND BETWEEN BERKSHIRE HATHAWAY AND OTHER TOP 10 S&P 500 INDEX FINANCIAL STOCKS, 2 OCTOBER 2017–30 SEPTEMBER 2020

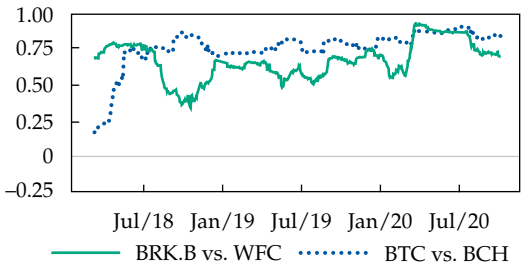
A. BRK.B vs. JPM and BTC vs. ETH



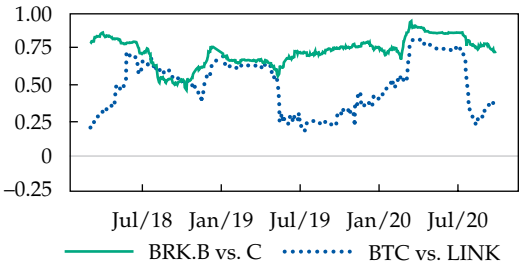
B. BRK.B vs. BAC and BTC vs. XRP



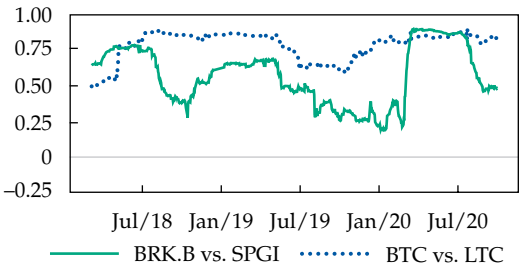
C. BRK.B vs. WFC and BTC vs. BCH



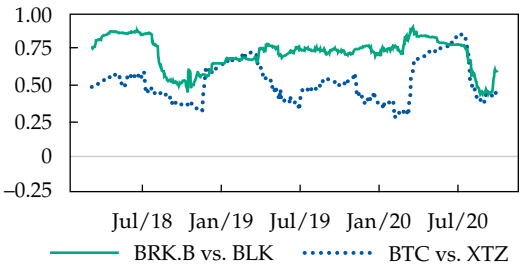
D. BRK.B vs. C and BTC vs. LINK



E. BRK.B vs. SPGI and BTC vs. LTC



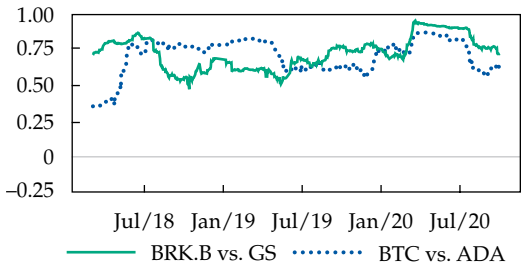
F. BRK.B vs. BLK and BTC vs. XTZ



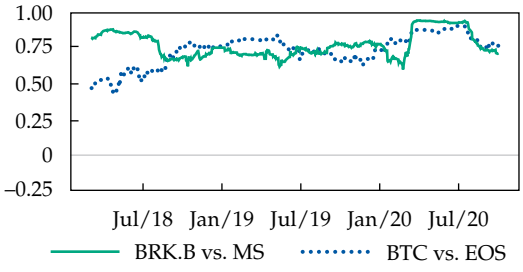
(continued)

FIGURE 10. ROLLING 90-DAY CORRELATIONS BETWEEN BITCOIN AND OTHER TOP 10 CONSTITUENTS IN THE BITWISE 10 INDEX AND BETWEEN BERKSHIRE HATHAWAY AND OTHER TOP 10 S&P 500 INDEX FINANCIAL STOCKS, 2 OCTOBER 2017–30 SEPTEMBER 2020 *(CONTINUED)*

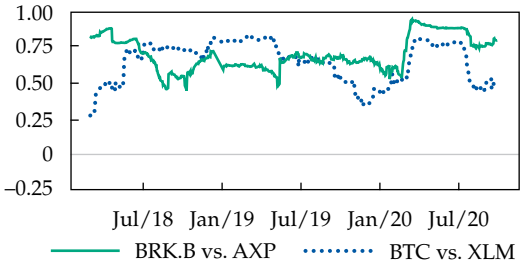
G. BRK.B vs. GS and BTC vs. ADA



H. BRK.B vs. MS and BTC vs. EOS



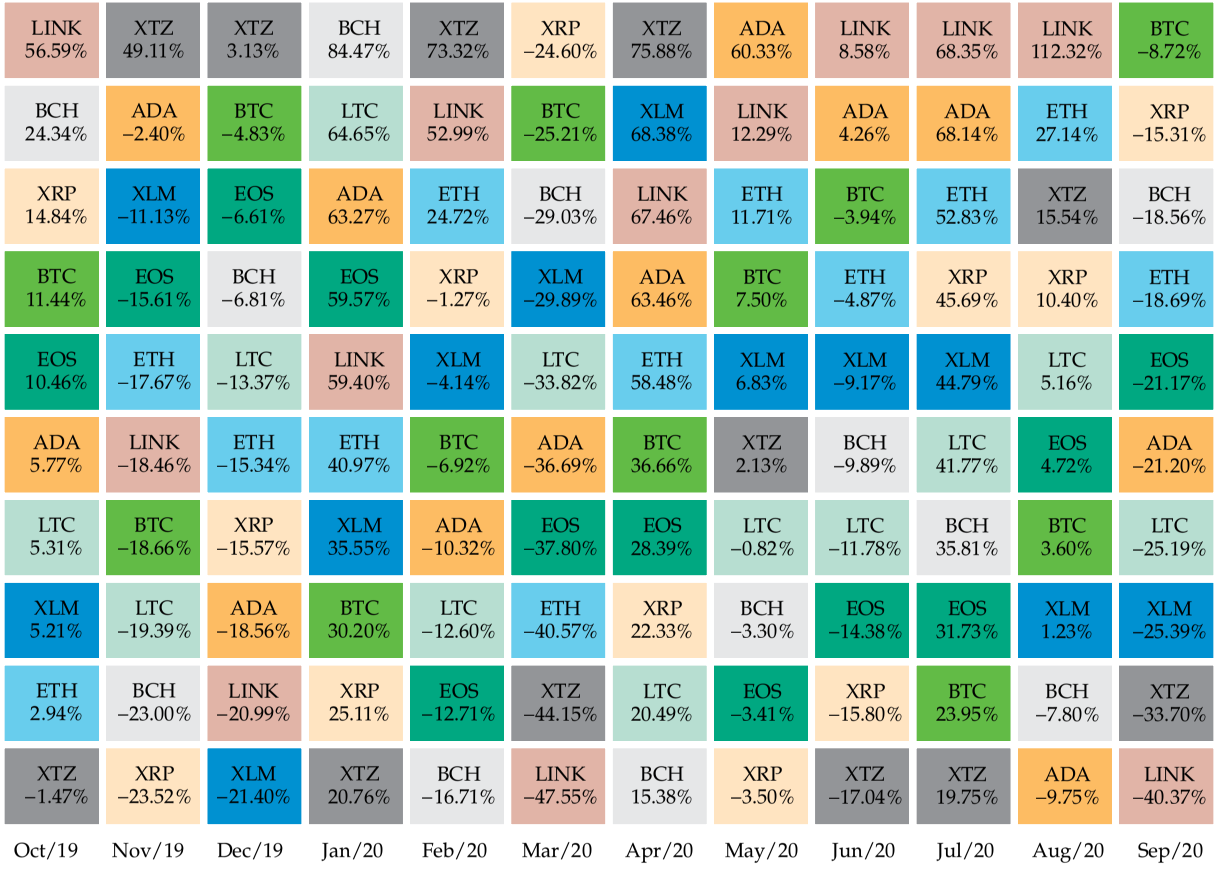
I. BRK.B vs. AXP and BTC vs. XLM



Notes: Prices of cryptoassets are calculated by Bitwise Asset Management from select exchanges considered to have real volume. S&P 500 financial stocks reflect the Financial Select Sector SPDR ETF. The Bitwise 10 Large Cap Crypto Index constituents, in descending index weight order, are bitcoin (BTC), ether (ETH), XRP, Bitcoin Cash (BCH), Chainlink (LINK), Litecoin (LTC), Tezos (XTZ), Cardano (ADA), EOS, and lumens (XLM). The Financial Select Sector SPDR ERF top 10 constituents are, in descending index weight order, Berkshire Hathaway Inc. Class B (BRK.B), JPMorgan Chase & Co. (JPM), Bank of America Corp. (BAC), Wells Fargo (WFC), Citigroup (C), S&P Global Inc. (SPGI), Blackrock Inc. (BLK), Goldman Sachs Group Inc. (GS), Morgan Stanley (MS), and American Express Company (AXP).

Sources: Bitwise Asset Management with data from IEX Cloud.

FIGURE 11. PERIODIC TABLE OF CRYPTOASSET RETURNS: MONTHLY PERFORMANCE OF CURRENT BITWISE 10 LARGE CAP CRYPTO INDEX (BITX) CONSTITUENTS, 30 SEPTEMBER 2019–30 SEPTEMBER 2020



Note: The BITX constituents, in alphabetical order by the ticker, are Cardano (ADA), Bitcoin Cash (BCH), bitcoin (BTC), ether (ETH), Chainlink (LINK), Litecoin (LTC), lumens (XLM), XRP, and Tezos (XTZ).

Source: Bitwise Asset Management.

In 2018, for instance, the index fell 77.7% while bitcoin fell 73.7%.

Figure 13 expands on these data by showing the year-to-date performance of all 10 assets that compose the index, showcasing the variable performance of various assets despite the overall high correlations. The index is up just 56.1% during this period, but three assets are up more than 100%, including one that is up more than 400%.

Looking ahead, as the cryptoasset space matures, the correlation between cryptoassets could quite possibly decline, as some of the fundamental parameters shaping the asset class harden (e.g., regulatory structure, tax structure, infrastructure for investing) and the distinctions between the use cases of various cryptoassets become more salient and understood. However, the dispersion of long-term returns among different cryptoassets will likely continue to be high.

Having discussed their individual performance, let's shift now to discussing the impact cryptoassets can have on a traditional portfolio.

The Impact of Crypto on a Diversified Portfolio

To evaluate the impact of bitcoin on a diversified portfolio, we consider the impact of adding various allocations of bitcoin to a portfolio with a 60% allocation to the Vanguard Total World Stock ETF (VT) and a 40% allocation to the Vanguard Total Bond Market ETF (BND)—the "traditional portfolio."[45] VT holds a market-cap-weighted portfolio of global stocks covering 98% of the world's market capitalization, and BND holds a market-value-weighted portfolio representing all taxable, investment-grade US bonds. This analysis assumes that all dividends are reinvested.

We use bitcoin because it has the longest track record of any cryptoasset and has been the easiest asset for professional investors to access during the study period. We examine the period from 1 January 2014 to 30 September 2020 because allocating to bitcoin was difficult for professional investors before 2014. We consider rolling one-, two-, and three-year holding periods during the 2014–20 time period. The use of a rolling-period analysis allows us to examine the results during bull, bear, and sideways markets for bitcoin and to minimize the impact of market timing.

Results

Our analysis shows that adding bitcoin to a portfolio has historically had a significant positive impact on long-term portfolio returns on both an absolute and a risk-adjusted basis.

For example, during the whole period under consideration (1 January 2014–30 September 2020), a quarterly rebalanced 2.5% allocation to bitcoin would have improved the traditional portfolio's returns by 23.9 percentage points. Importantly, volatility would have remained almost constant (10.5% versus 10.3%). As a result, the Sharpe ratio expanded from 0.54 to 0.75.

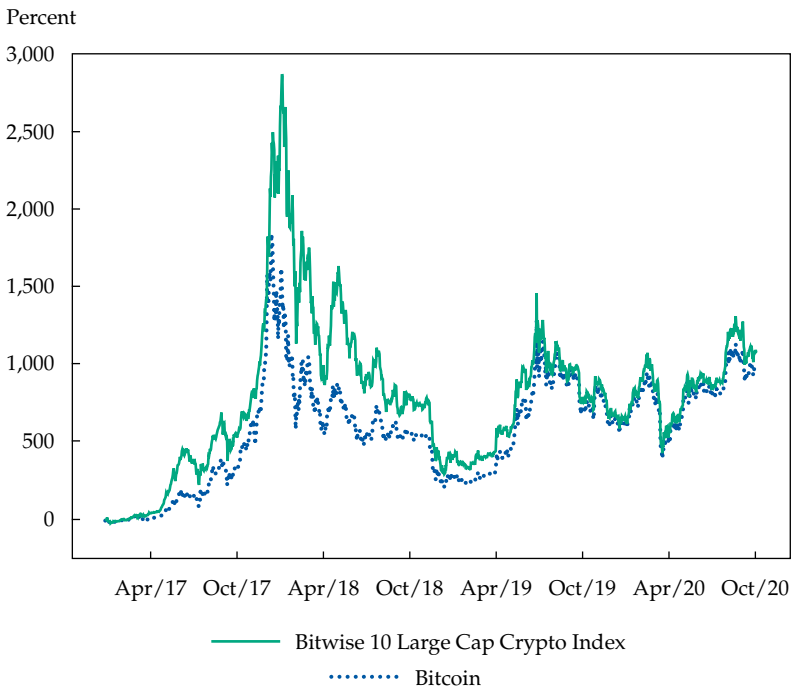
These results—as well as the full results for 0%, 1%, 2.5%, and 5% bitcoin allocations—are shown in **Figure 14** and **Table 3**.

Bitcoin's Portfolio Impact over Rolling Time Frames and Holding Periods

The positive impact over the 2014–20 period is notable, but it is also unsurprising: It captures a

[45]This section updates the analysis undertaken in the white paper "The Case for Bitcoin in an Institutional Portfolio," published by David Lawant and Matt Hougan in May 2020, by extending the cutoff date to 30 June 2020 from 31 March 2020. The full original paper is available at https://static.bitwiseinvestments.com/Research/Bitwise-The-Case-For-Bitcoin-In-An-Institutional-Portfolio.pdf.

FIGURE 12. CUMULATIVE RETURNS OF BITWISE 10 LARGE CAP CRYPTO INDEX VS. BITCOIN, 1 JANUARY 2017–30 SEPTEMBER 2020



Notes: Performance of an index is not illustrative of any particular investment. It is not possible to invest directly in an index. The darker green line for the Bitwise 10 index represents a hypothetical, backtested, and unaudited return stream that does not represent the returns of an actual account. Index performance does not include the fees and expenses that are charged by the fund. Actual returns may differ materially from hypothetical, backtested returns. Backtesting is calculated by retroactively applying a financial model or index-weighting methodology to the historical data to obtain returns. The inception date for the Bitwise 10 index is 1 October 2017; data before 1 October 2017 are backtested.

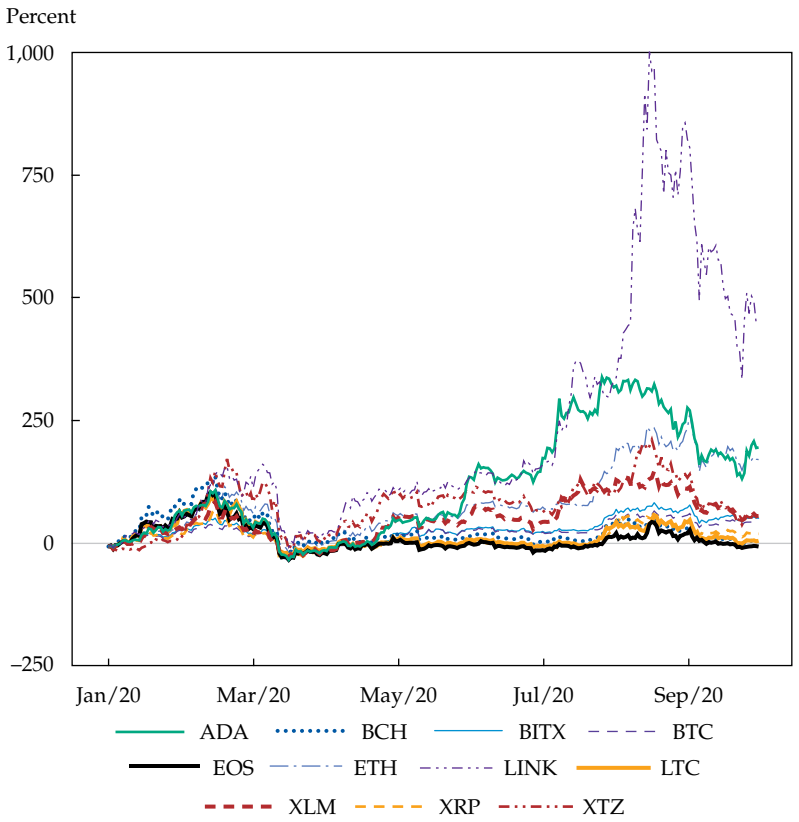
Source: Bitwise Asset Management.

period during which bitcoin's price appreciated substantially. To evaluate bitcoin's contribution to a portfolio over variable performance, we use a rolling-period analysis to simulate different holding periods over all possible time frames instead of point-in-time analysis.

Using a quarterly rebalancing frequency and allocating to bitcoin proportionally from the stock and bond side of the portfolios, a 2.5% allocation to bitcoin increases the returns of a diversified portfolio in 100% of three-year periods, 97% of two-year periods, and 74% of one-year periods since 2014. **Table 4** highlights those contributions (above and beyond the return of the overall portfolio) from both an absolute and a risk-adjusted return perspective.

Figure 15, **Figure 16**, and **Figure 17** illustrate this impact over one-, two-, and three-year

FIGURE 13. CUMULATIVE RETURNS: BITWISE 10 LARGE CAP CRYPTO INDEX AND CURRENT INDEX CONSTITUENTS, 31 DECEMBER 2019–30 SEPTEMBER 2020



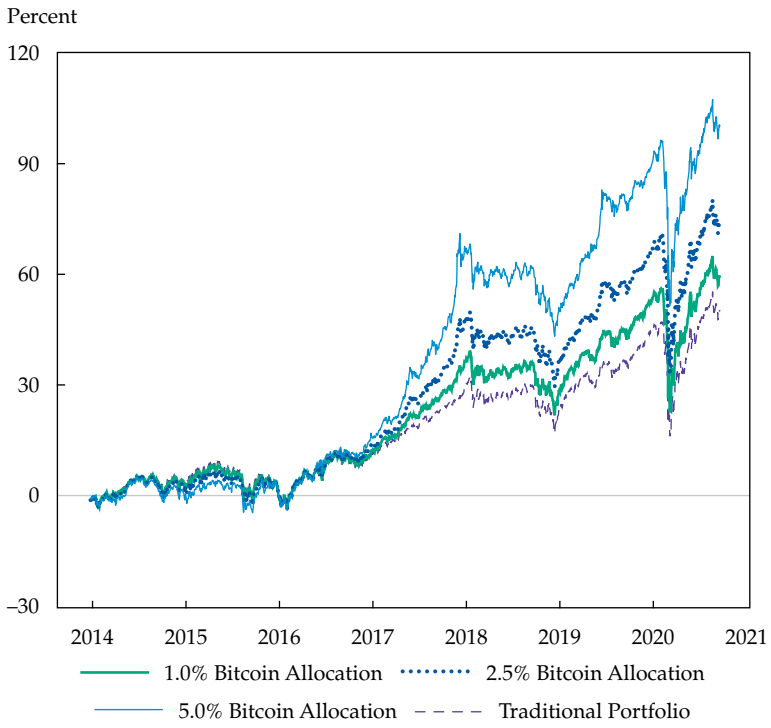
Note: Index composition is as of the last date in the covered period.

Source: Bitwise Asset Management.

rolling return periods. Positive contributions are shown in blue, and negative contributions are shown in orange. Figures 15, 16, and 17 have different start points because of the different lengths of the holding periods. For example, the first one-year holding period during the study stretched from 1 January 2014 to 1 January 2015, and the chart of one-year holding periods, therefore, shows results starting from 1 January 2015; in comparison, the first two-year holding period ended on 1 January 2016, and the two-year chart, therefore, begins at that date.

Over each of the three durations, the portfolio impact has been both significant and asymmetrically skewed on the positive side: For example, the median impact of a 2.5% allocation to bitcoin on a 60/40 portfolio over a three-year period has been to increase total returns by nearly 15%. Negative impacts, where they have occurred, have been limited.

FIGURE 14. CUMULATIVE RETURNS: TRADITIONAL PORTFOLIO WITH AND WITHOUT QUARTERLY REBALANCED BITCOIN ALLOCATIONS, 1 JANUARY 2014–30 SEPTEMBER 2020



Source: Bitwise Asset Management.

TABLE 3. PORTFOLIO PERFORMANCE METRICS (PORTFOLIO REBALANCED QUARTERLY), 1 JANUARY 2014–30 SEPTEMBER 2020

Portfolio	Cumulative Return	Annualized Return	Volatility (Annualized Std. Dev.)	Sharpe Ratio	Maximum Drawdown
Traditional portfolio, quarterly rebalanced	50.61%	6.26%	10.32%	0.54	21.07%
Traditional portfolio + 1.0% bitcoin	59.89	7.21	10.33	0.63	21.32
Traditional portfolio + 2.5% bitcoin	74.47	8.61	10.53	0.75	21.80
Traditional portfolio + 5.0% bitcoin	100.51	10.87	11.26	0.90	22.76

Source: Bitwise Asset Management.

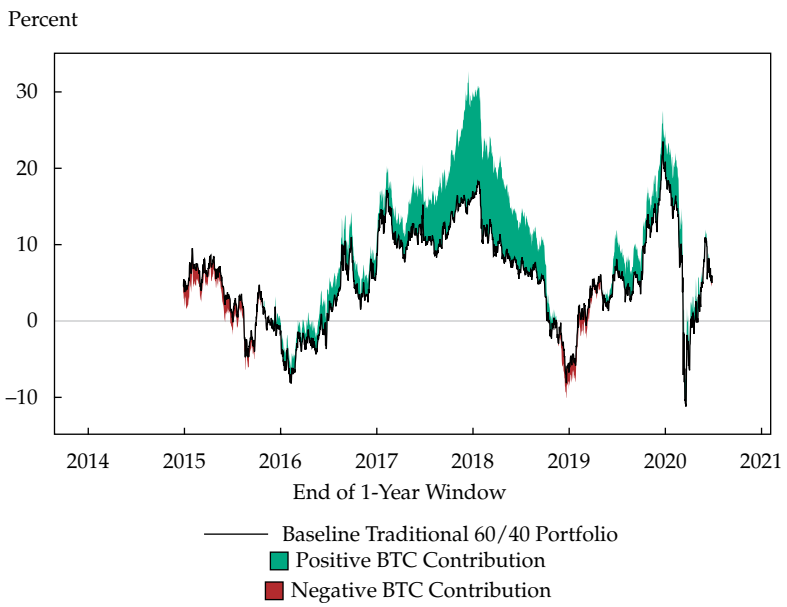
TABLE 4. CONTRIBUTION OF A 2.5% BITCOIN ALLOCATION TO A TRADITIONAL PORTFOLIO USING QUARTERLY REBALANCING, 1 JANUARY 2014–30 SEPTEMBER 2020

Holding Period	Rolling Cumulative Return Contribution					Rolling Sharpe Ratio Contribution				
	Maximum	Median	Minimum	Win Rate	Loss Rate	Maximum	Median	Minimum	Win Rate	Loss Rate
1 year	16.70 pp	2.80 pp	−3.00 pp	74.37%	25.63%	2.03	0.29	−0.45	73.61%	26.39%
2 years	20.27 pp	7.81 pp	−0.65 pp	96.89%	3.11%	1.10	0.41	−0.04	96.89%	3.11%
3 years	22.39 pp	14.65 pp	1.83 pp	100.00%	0.00%	0.74	0.48	0.07	100.00%	0.00%

Source: Bitwise Asset Management.

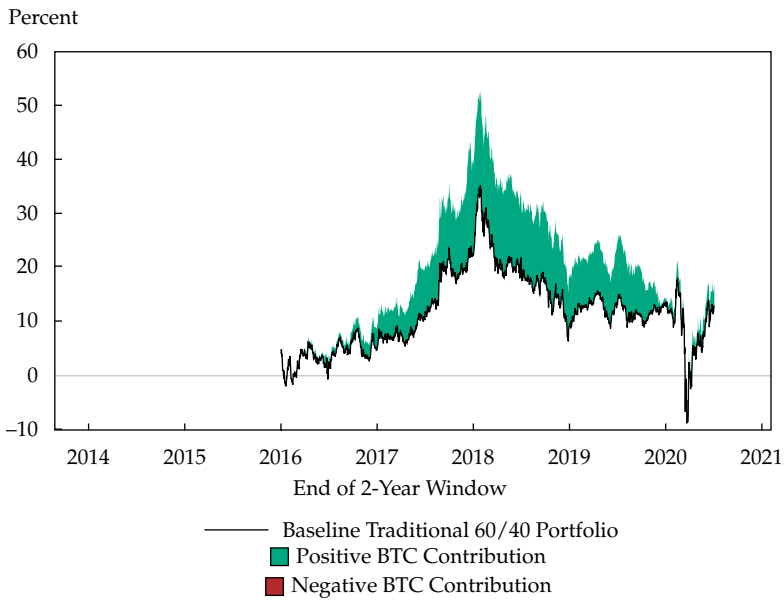
Importantly, just like in the point-in-time analysis, this positive impact came without a commensurate rise in portfolio volatility. Although bitcoin itself is volatile, its positive impact on returns has outweighed its negative contribution to risk, leading to significant increases in returns adjusted by volatility as measured by the Sharpe ratio. For instance, over three-year holding periods, the 2.5% allocation to bitcoin boosted the portfolio's Sharpe ratio by 41% on average

FIGURE 15. CONTRIBUTION OF A 2.5% BITCOIN ALLOCATION TO A 60/40 PORTFOLIO: ONE-YEAR ROLLING CUMULATIVE RETURNS



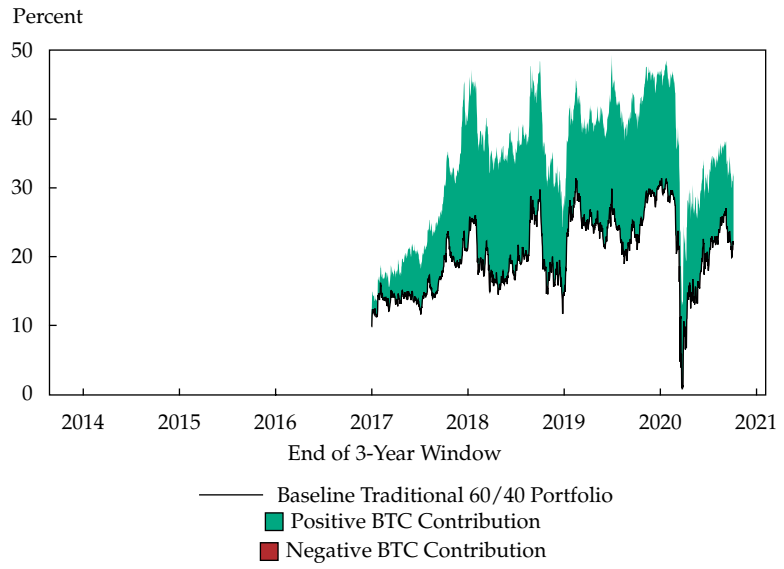
Source: Bitwise Asset Management.

FIGURE 16. CONTRIBUTION OF A 2.5% BITCOIN ALLOCATION TO A 60/40 PORTFOLIO: TWO-YEAR ROLLING CUMULATIVE RETURNS



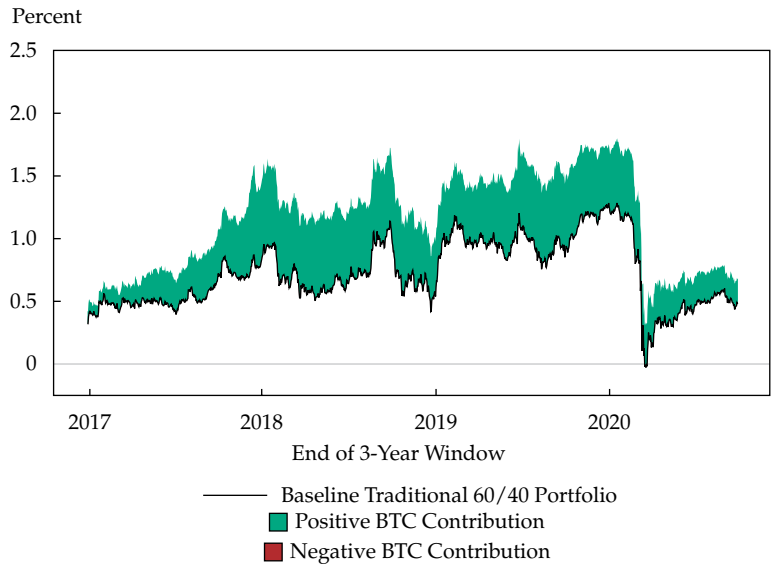
Source: Bitwise Asset Management.

FIGURE 17. CONTRIBUTION OF A 2.5% BITCOIN ALLOCATION TO A 60/40 PORTFOLIO: THREE-YEAR ROLLING CUMULATIVE RETURNS



Source: Bitwise Asset Management.

FIGURE 18. QUARTERLY REBALANCING: CONTRIBUTION OF A 2.5% BITCOIN ALLOCATION TO A 60/40 PORTFOLIO (THREE-YEAR ROLLING SHARPE RATIO)



Source: Bitwise Asset Management.

The Importance of Rebalancing

In containing risk, investors in bitcoin must assume some type of rebalancing program or the bitcoin allocation can come to overwhelm the portfolio and lead to a sizable increase in risk. **Figure 18** and **Figure 19** showcase the impact of rebalancing by comparing the rolling three-year impact that adding bitcoin to a portfolio had on the portfolio's Sharpe ratio both with and without a quarterly rebalancing program.

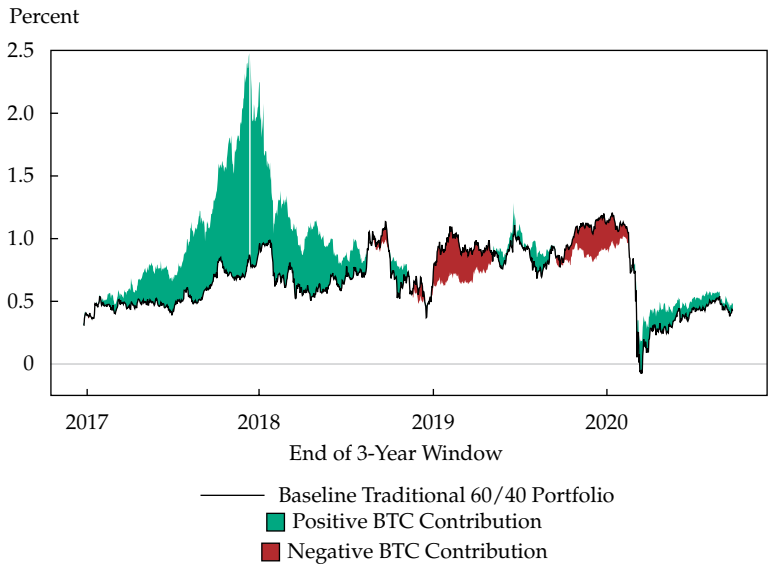
The non-rebalanced portfolio shows substantial periods when bitcoin hurt the Sharpe ratio, particularly for the three-year periods ending after January 2019. This finding is not surprising, given that bitcoin fell significantly in 2018; absent rebalancing, these negative returns dragged significantly on the risk-adjusted returns.

The importance of rebalancing is further emphasized when you consider the returns if investors allocated to bitcoin at its all-time high on 16 December 2017—the worst time to have bought—and held through the end of our study, 30 September 2020. Bitcoin fell 44.8% during this period.

Without rebalancing, this small allocation would have reduced overall returns by 1.4 percentage points, a significant amount. A quarterly rebalanced allocation to bitcoin, however, would have *boosted* returns by 1.8 percentage points.

How can an asset that declines 52.7% boost the returns of a portfolio? The answer comes from bitcoin's combination of high volatility, low correlation, and liquidity, which allows rebalancing. As discussed in an article by Bouchey,

FIGURE 19. NO REBALANCING: CONTRIBUTION OF A 2.5% BITCOIN ALLOCATION TO A 60/40 PORTFOLIO (THREE-YEAR ROLLING SHARPE RATIO)



Source: Bitwise Asset Management.

Nemtchinov, Paulsen, and Stein, applying a disciplined rebalancing strategy to a volatile, noncorrelated asset can yield positive portfolio impacts.[46]

Note, of course, that rebalancing raises the potential for loss as well: The most you can lose from a static allocation is the amount invested, whereas a rebalancing strategy can double down on a losing position if returns trend lower with no relief. Also note that the previous simulations do not account for transaction costs or taxes.

Bitcoin is a highly liquid asset, so transaction costs are relatively low. For context, the average inside spread on Coinbase Pro, the most liquid US bitcoin spot exchange, for the 30 days ending 19 October 2020 was 0.003%. Larger transactions will have higher costs: The average spread for an order-book-sweeping 10-bitcoin transaction (worth in excess of $100,000) on Coinbase Pro over that same time period was 0.061%.[47] Standard fees and/or commission costs might also apply, depending on the trading approach taken.

Taxes are highly subject to individual circumstances. Part V of this document addresses the taxation of cryptoassets.

[46]Paul Bouchey, Vassilii Nemtchinov, Alex Paulsen, and David M. Stein, "Volatility Harvesting: Why Does Diversifying and Rebalancing Create Portfolio Growth?" *Journal of Wealth Management* 15 (2 2012): 26–35.

[47]"Bitcoin Trading Volume," data.bitcoinity.org. Data are from 19 September 2020 through 19 October 2020, using hourly snapshots of the order book at Coinbase Pro. The inside spread is calculated by comparing the best bid with the best offer on an hourly basis. The 10-bitcoin spread is calculated by aggregating posted bids and offers that add up to 10 bitcoin or more on an hourly basis.

How Much Bitcoin Is the Right Amount?

Perhaps the most important question when allocating to crypto is, How big a position should you have? **Table 5** examines that question, looking at the impact of allocating between 0% and 10% of a portfolio to bitcoin over rolling three-year periods.

Table 5 suggests that for this set of rolling periods, increasing the allocation to bitcoin consistently led to higher average returns and higher average Sharpe ratios. For instance, a 1% allocation to bitcoin added 5.3%, on average, to the portfolio's return and boosted the Sharpe ratio by 0.19, whereas a 5% allocation to bitcoin added 28.1% to the portfolio's return and boosted the Sharpe ratio by 0.69, on average.

Note, however, that the impact on risk statistics is not linear. As shown, the average maximum drawdown of the portfolio remains largely flat for allocations to bitcoin between 0% and 4% because at this size allocation, bitcoin never competes with the equity allocation to drive the portfolio's maximum drawdown. Above 4%, however, the maximum drawdown rises rapidly, with each 1% additional allocation to bitcoin increasing the maximum drawdown by roughly 1%. This might provide a ceiling on appropriate allocations for risk-sensitive investors.

Summary

To date, bitcoin has been a rare asset, combining the return characteristics of a classic alternative asset with the liquidity characteristics of publicly traded equities. The key question is whether it will retain these key characteristics in the future.

The Future for Cryptoasset Returns

Looking at the historical returns of bitcoin or other cryptoassets and deciding that you should have allocated to them in the past is easy. But will these return characteristics continue in the future?

The best approach to tackling this question is to consider each of the three core characteristics of cryptoassets separately: high volatility, low correlation with traditional assets, and high potential returns.

High Volatility

High volatility has been a characteristic of the cryptomarket since its inception and is likely to continue in the future.

Cryptoassets and cryptoasset blockchains are still in a relatively nascent phase of their development, and although certain existential risks have been reduced over time, including those related to user interest, regulation, and banking access, big questions remain, including ones related to adoption, technical hurdles, and additional regulation.

Volatility has been declining over time: Bitcoin's standard deviation of daily returns was 5.4% between 2013 and 2015, 4.1% between 2015 and 2018, and 3.7% between 2019 and September 2020. Generally, we expect this pattern of high but declining volatility to continue.

Low Correlation with Traditional Assets

The low correlation between cryptoassets and traditional asset classes will likely persist because the underlying drivers of crypto

TABLE 5. KEY PORTFOLIO METRICS BY BITCOIN ALLOCATION (QUARTERLY REBALANCED PORTFOLIOS), 1 JANUARY 2014–30 SEPTEMBER 2020

Bitcoin Allocation	Cumulative Return			Sharpe Ratio			Standard Deviation			Maximum Drawdown		
	Min.	Average	Max.	Min.	Average	Max.	Min.	Average	Max.	Min.	Average	Max.
0%	1.05%	20.60%	31.64%	−0.032	0.718	1.279	6.90%	8.30%	12.97%	8.37%	12.62%	21.07%
1%	5.88	25.92	38.28	0.110	0.909	1.533	6.95	8.31	13.03	8.42	12.55	21.32
2%	10.66	31.39	45.47	0.241	1.075	1.724	7.23	8.47	13.19	8.34	12.49	21.61
3%	13.21	37.01	53.55	0.361	1.212	1.866	7.69	8.76	13.45	8.27	12.45	22.00
4%	14.20	42.79	61.91	0.464	1.322	1.988	7.99	9.15	13.80	8.20	12.65	22.38
5%	15.17	48.73	71.51	0.491	1.408	2.106	8.13	9.62	14.21	8.41	13.42	22.76
6%	16.13	54.82	82.02	0.514	1.475	2.254	8.31	10.16	14.70	8.32	14.32	23.13
7%	16.93	61.08	93.03	0.527	1.528	2.373	8.54	10.75	15.29	8.34	15.23	23.51
8%	17.56	67.50	104.63	0.531	1.569	2.471	8.81	11.38	15.93	8.36	16.14	23.88
9%	18.16	74.08	116.92	0.533	1.601	2.550	9.12	12.04	16.60	8.41	17.05	24.24
10%	18.75	80.83	129.72	0.532	1.627	2.617	9.45	12.73	17.29	8.59	17.97	24.61

EXHIBIT 1. EXPECTED FUTURE RETURN DRIVERS BY ASSET CLASS

Equities	Bonds	Cryptoassets
Corporate profits	Economic growth	Investor adoption
Economic growth	Interest rates	Millennial wealth
Interest rates	Issuance	Regulatory developments
Productivity		Weakening trust in authorities
		Institutionalization

Source: Bitwise Asset Management.

are significantly different from the underlying drivers of stocks and bonds, as highlighted in **Exhibit 1**.

These historically low correlations, however, might increase slightly in the years to come, given that certain drivers of crypto's historically uncorrelated returns are fading from the market. For instance, in the early days of crypto, the market could potentially collapse with a single regulatory decision, an unanticipated technological bug, or another such factor. As an example, at one point, only one banking institution (Silvergate Capital) was willing to provide basic cash banking services to crypto exchanges; the withdrawal of that support would have severely affected crypto liquidity and, therefore, prices.

Today, crypto exists on a stronger foundation. To follow that singular thread, the Office of the Comptroller of the Currency (OCC) recently issued a letter stating that all banks may provide banking services to the crypto industry.[48]

The removal of many existential concerns has boosted crypto's returns over the past decade in a manner disconnected from the broader capital economy, and those asynchronous drivers might be on the ebb.

Additionally, as cryptoassets penetrate further into their target markets, market-specific dynamics and investor flows might play a larger role in influencing returns, which will have an impact on correlations. As bitcoin penetrates further into the digital gold market, for instance, one would expect its correlation with gold (which is relatively low today) to rise.

Finally, if crypto transforms from an asset primarily owned by retail investors to one primarily owned by institutional investors (like most assets), the characteristics of its return profile might change as well.

Notwithstanding those factors, however, that correlations will rise substantially is unlikely, given the materially different core drivers of returns.

High Potential Returns

The question of crypto's future return potential is both the most interesting for investors and the most difficult to forecast.

Cryptoasset bulls argue that historical high returns will persist. They assert that crypto has yet to even begin to penetrate the mainstream,

[48]Office of the Comptroller of the Currency, "Interpretive Letter #1170" (22 July 2020). www.occ.gov/topics/charters-and-licensing/interpretations-and-actions/2020/int1170.pdf.

most institutional investors remain on the sidelines, use cases are just emerging, significant exogenous risks still exist and returns will follow when they are mitigated, no crypto ETF is available in the United States, and so on. These bulls paint a picture of a future world where cryptoassets are as familiar to individuals as cash and gold and where using a cryptoasset-powered blockchain to conduct such activities as lending, remittance, escrow, title transfer, automated market making, and settlement becomes as familiar as using a computer to write a paper. They point out that even the most established cryptoasset (bitcoin) has penetrated less than 2% of its most obvious comparable (gold) and suggest that prices could easily go 10–100 times higher.

Cryptoasset bears argue the opposite case, noting that the valuations of large-cap cryptoassets are already measured in the tens and even hundreds of billions of dollars, comparable to the valuations of some of the largest corporations in America. These bears argue that cryptoassets are highly overvalued and in some cases scams are destined to collapse and be remembered as the cyberequivalent of the tulip bulb market bubble. They note that cryptoassets have not yet returned to the all-time highs they hit in late 2017 and early 2018 and suggest that they might never retouch those lofty levels.

As with all assets, differing views make a market, and crypto is a new and volatile market indeed. Although nothing can be done about crypto's limited track record, the empirical truth is that crypto has survived multiple moments of panic and disaster and has each year set lows higher than the year before. Our view, aligned with the bulls, is that given crypto's still-early stage of development—with most professional investors yet to allocate to the space—it has significant room to run. If even small percentages of the tens of trillions of dollars invested in adjacent asset classes, such as commodities, alternatives, cash, and real estate, transfer into the crypto market, the impact and upside potential will be significant. Risks remain, but so does potential.

PART V: KEY CONSIDERATIONS AND RISKS FOR INVESTORS

In this part, we discuss certain framework considerations, compare various approaches to investing in crypto, and examine pertinent risk factors.

Framework Considerations: Custody, Taxation, and Regulation

As investors move down the path of exploring investment into crypto, they should be aware of several practical considerations, as with any asset class and certainly any alternative or real asset. This section briefly outlines the top three considerations for crypto: custody, taxation, and regulation.

Custody

One particular challenge for investors allocating to crypto is custody, which in this case refers to how one securely holds and stores a cryptoasset.

The ownership of a given cryptoasset is established by controlling a password, or "private key." If that password is lost or stolen, the related cryptoasset is lost forever. This finality is necessary to permit some of crypto's key advantages, such as rapid settlement, but it presents a significant risk if not handled appropriately.

Best practices in the space call for investors to hold cryptoasset private keys in "cold storage,"

otherwise known as "offline storage." To oversimplify, you can store that password either online (say, in a computer database connected to the internet) or offline—for example, written down on a piece of paper placed in a safe deposit box. Storing a password online exposes it to the risk of getting hacked and is, therefore, riskier than storing it offline, especially in an era of constant data breaches (e.g., Equifax, Yahoo).

Cold storage can be accessed in a variety of ways. Some investors with sophisticated computer science backgrounds can create their own. Another approach is to purchase a dedicated hardware "wallet," such as a Ledger or a Trezor, which uses hardware chip design to create an offline-like experience.

Most retail investors use investing apps such as Coinbase or Kraken, which provide all-in-one brokerage services for buying and selling cryptoassets and store the assets for users, often in a setting that is partially online and partially offline.

The most professional solution, however, is to work with a purpose-built, regulated, insured, enterprise-grade custodian. Today, regulated crypto custody providers include familiar financial names, such as Fidelity Digital Assets, and crypto-specialist firms, such as Coinbase Custody Trust Company, Anchorage, and BitGo. These firms have bank trust charters, often from New York or South Dakota, and undergo significant regulatory scrutiny. By and large, professional investors either work directly with such firms or access them by proxy through funds and investment products that use these custodians to hold assets.

Taxation

The tax treatment of cryptoassets is confusing to many people, largely because of the nomenclature that surrounds the crypto space.

Some people call cryptoassets "cryptocurrencies" and expect them to be taxed in the same way as other currency investments, with all gains (regardless of holding period) taxed as ordinary income. Other people consider cryptoassets to be commodities and assume they are taxed in the same way as commodity investments, which are often made using futures and are, therefore, subject to Section 1256 tax treatment, with mark-to-market annual taxation on gains. Still others anchor on the idea of bitcoin as "digital gold" and assume that all cryptoassets are taxed the same as gold, which is treated as a collectible by the IRS and taxed at 28% on any long-term capital gains.

In fact, the IRS has ruled that cryptoassets are taxed in the same way as property.[49] In general, that means that cryptoasset investments are taxed with traditional short- and long-term capital gains tax rates depending on the length of the holding period. (This does not apply to investments in cryptoasset futures, which are taxed as futures.)

Importantly, this study is not intended to be read as tax advice. Every situation is different, and investors should check with a tax professional before pursuing any tax strategy.

Regulation

The regulatory treatment of cryptoassets is evolving and varies from jurisdiction to jurisdiction. Investors should expect that kind of evolution and variation to continue.

Among the key regulatory developments that have defined the cryptoasset market in the United States since its creation are the following:

[49]The IRS has a comprehensive and readable FAQ on cryptoasset taxation available at www.irs.gov/individuals/international-taxpayers/frequently-asked-questions-on-virtual-currency-transactions.

- *2013: Financial crimes enforcement network issues guidance on crypto anti-money-laundering/know-your-client processes (FIN-2013-G001):*[50] In the first major regulatory development affecting the cryptoasset space in the United States, the Financial Crimes Enforcement Network clarified that crypto exchanges and other actors fall within its definition of "money transmitters" and must have appropriate anti-money-laundering (AML), know-your-client (KYC), and risk-monitoring programs in place.

- *2014: IRS issues initial guidance on crypto taxation:*[51] In its first guidance on cryptoassets, the IRS clarified the tax treatment of crypto as property and developed a clear FAQ list to help investors understand the treatment of these assets.

- *2015: In CoinFlip order, Commodity Futures Trading Commission asserts regulatory oversight of bitcoin as a commodity:*[52] This order defined bitcoin as a commodity and stated that online trading facilities that make markets in bitcoin derivatives must register as a designated "market maker" or "swap execution facility."

- *2015: New York State issues BitLicense:*[53] Many years in the making—and a requirement for firms conducting cryptocurrency business in the state—the New York State "BitLicense" instantly became the most developed state-level regulatory framework for the crypto space.

- *2017: SEC issues DAO Report, clarifies many initial coin offerings are securities offerings:*[54] In one of its first major actions surrounding cryptoassets, the SEC clarified that many initial coin offerings (ICOs)—a fundraising tool used extensively in 2015–2017 to raise assets to launch new cryptoasset-powered blockchains—were unregistered securities offerings. This finding cleared the way for substantial enforcement activity in the ICO market, removing some of the worst excesses of the 2017 bull market.

- *2017: Regulated bitcoin futures launch on Cboe, CME:*[55,56] In December 2017, both Cboe and the CME Group launched regulated bitcoin futures contracts. Though the Cboe contracts were subsequently

[50]Department of the Treasury Financial Crimes Enforcement Network, "Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies" (18 March 2013). www.fincen.gov/resources/statutes-regulations/guidance/application-fincens-regulations-persons-administering.

[51]Internal Revenue Service, "Virtual Currency: IRS Issues Additional Guidance on Tax Treatment and Reminds Taxpayers of Reporting Obligations" (9 October 2019). www.irs.gov/newsroom/virtual-currency-irs-issues-additional-guidance-on-tax-treatment-and-reminds-taxpayers-of-reporting-obligations.

[52]Commodity Futures Trading Commission, "In the Matter of CoinFlip, Inc., d/b/a Derivabit, and Francisco Riordan" (17 September 2015). www.cftc.gov/sites/default/files/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfcoinfliprorder09172015.pdf.

[53]New York State Department of Financial Services, "Regulation of the Conduct of Virtual Currency Businesses" (25 February 2015). https://govt.westlaw.com/nyreg/Document/I41a4b512b7e311e493b50000845b8d3e?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=%28sc.Default%29.

[54]Securities and Exchange Commission, "Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO" (25 July 2017). www.sec.gov/litigation/investreport/34-81207.pdf.

[55]Cboe Global Markets, "Cboe Plans December 10 Launch of Bitcoin Futures Trading" (4 December 2017). http://ir.cboe.com/~/media/Files/C/CBOE-IR-V2/press-release/2017/cboe-plans-december-10-launch-of-bitcoin-futures-trading.pdf.

[56]Chicago Mercantile Exchange, "CME Group Announces Launch of Bitcoin Futures" (31 October 2017). www.cmegroup.com/media-room/press-releases/2017/10/31/cme_group_announceslaunchofbitcoinfutures.html.

sunsetted, the CME market has become one of the largest bitcoin markets in the world.

- *2019: The Financial Action Task Force provides guidance on AML:*[57] In a major international regulatory development, the Financial Action Task Force—a multinational organization tasked with combating money laundering and terrorism financing—issued guidance requiring all crypto exchanges to conduct material KYC information gathering and to pass such information to one another when transferring funds.

- *2018–2019: SEC clarifies nonsecurity status of Ethereum:* In a series of steps—including a speech by the SEC director, William Hinman,[58] and a formal statement[59] and framework[60] from the SEC's FinHub division—the SEC clarified that Ethereum, despite having started as a security, no longer qualifies as one. This interpretation provided significant comfort around the security status of other large cryptoassets as well.

- *2020: OCC clarifies that all national banks can custody cryptoassets:*[61] In a significant interpretative letter, the OCC clarified that all federally chartered banks and thrifts may provide crypto custody services to clients. The letter also stated that banks may provide cash banking services to crypto-related companies as well.

The most appropriate way to view this series of developments is as a series of clarifications, normalizations, and tightening of regulations surrounding crypto, pulling its regulation closer in line with that of other asset classes and financial products. Although this progressive tightening of regulations runs counter to some of the perceived founding ethos behind cryptoassets, most view it as progress because it is necessary to allow for mainstream adoption and acceptance.

The current regulatory acceptance of crypto has limitations, of course. For instance, the SEC has repeatedly rejected applications to list a cryptoasset ETF, citing unsatisfied concerns about market manipulation, custodial risks, audit risks, and other factors. Efforts continue, however, and the lengthy process is similar to the experience of the initial approvals of ETFs in other asset classes and complex markets, including gold, commodities, and leveraged products.

Comparing Various Approaches to Investing in Cryptoassets

Investors looking to get exposure to cryptoassets have several options today. Each comes with certain features and trade-offs that must be weighed carefully before one invests. This section will walk through the six most common

[57]Financial Action Task Force, "Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers" (21 June 2019). www.fatf-gafi.org/media/fatf/documents/recommendations/RBA-VA-VASPs.pdf.

[58]William Hinman, "Digital Asset Transactions: When Howey Met Gary (Plastic)," US Securities and Exchange Commission speech (14 June 2018). www.sec.gov/news/speech/speech-hinman-061418.

[59]William Hinman and Valerie Szczepanik, "Statement on 'Framework for "Investment Contract" Analysis of Digital Assets,'" US Securities and Exchange Commission public statement (3 April 2019). www.sec.gov/news/public-statement/statement-framework-investment-contract-analysis-digital-assets.

[60]US Securities and Exchange Commission, "Framework for 'Investment Contract' Analysis of Digital Assets." www.sec.gov/corpfin/framework-investment-contract-analysis-digital-assets.

[61]Office of the Comptroller of the Currency, "Interpretive Letter #1170."

investment approaches—brokerage apps, private funds, publicly traded shares, direct holdings with a custodian, CME futures, and venture capital funds—and enumerate the trade-offs therein.

Approach 1: Crypto Brokerage Apps or Other Brokerage-Like Windows

For traditional retail investors, the primary way to access crypto has historically been through crypto-specific brokerage websites and apps, such as Coinbase and Kraken. These apps allow users to buy and sell various cryptoassets in a fashion similar to how they would buy or sell equities through a brokerage solution, such as Charles Schwab. In fact, newer equity brokerage platforms, such as Robinhood, as well as many popular fintech applications, including Square's Cash App and PayPal, now offer crypto buying, selling, and trading as well.

The biggest crypto-specific brokerage companies today have tens of millions of users and process hundreds of millions of dollars in daily trading volume.

The primary advantage of these approaches is convenience. Often developed by well-funded companies and sporting high-quality user experience designs, these apps allow individual investors to easily transfer dollars in and to either purchase or sell multiple different cryptoassets.

With respect to security, the landscape of brokerage apps is large and varies widely. Some hold assets in robust (albeit often not 100% cold storage) custodial solutions, such as Coinbase, whereas others are negligent and have even lost client funds. You should be discerning about which particular service you use.

The challenges of this approach lie in the details, including relatively high fees on transactions (often greater than 1%–3% total for fees and spreads); non-competitive trade execution; the hassle of opening and funding a new account; the inability to invest via trusts, tax-advantaged accounts, and other entities; unclear compliance stature; delays and limits on withdrawals; and the personal security/custody risk that comes with holding assets in a mobile phone app. This last issue is particularly important: Even if the brokerage does not get hacked, your phone or email could. Users have been targeted in the past by cyberhackers using such techniques as SIM hacking and phishing to steal significant funds, with no recourse for recovery. Also note that for advisers and other professional investors, these holdings do not flow into standard reporting programs, which can present a significant challenge to standard workflows.

Nonetheless, brokerage apps and websites are the most popular way for individuals to invest and can be a great and easy solution for retail-level investing. However, being discerning about the specific service you use is important.

Approach 2: Passive and Active Private Placement Funds

As an alternative to investing apps, many private funds have emerged that offer certain investors access to cryptoassets in a familiar, fund-like setting. One of the first such funds to be widely recognized was the Pantera Bitcoin Fund, which launched in July 2013 and offered accredited investors an easy way to invest in bitcoin at a time when it was trading at roughly $60.

Since 2013, the landscape of private placement funds has expanded dramatically. Investors now have access to a wide variety of options, including single-asset funds, index funds, and active

hedge funds. These funds invest across an array of cryptoassets, including large caps, smaller assets, and everything in between. There are passive funds, holding single coins or an index of multiple coins, and active funds, running everything from long-only, long–short, market-neutral, event-driven, fundamental-driven, and special situation strategies. In general, passive funds offer liquidity daily or weekly, whereas active funds are more likely to offer quarterly or annual liquidity. In either rubric, high-quality fund providers custody assets with enterprise-grade regulated and insured custodians, though some firms trading smaller-cap assets have to hold those coins through other means because regulated custodians do not yet offer support.

The primary advantage of these funds is that they offer the ability to buy and sell managed exposure to cryptoassets in a familiar fund format. Funds handle custody, trading, reporting, tax, audit, and other features.

The challenges of these funds include that they are available only to accredited investors and have substantial paperwork burdens and that the hassle of funding and reporting can present significant logistical challenges, particularly for financial advisers or other professional investors who invest on behalf of multiple clients.

The choice between single-asset, index, and active funds in crypto is similar to the choice between single stocks, index funds, and active funds in equities. Single-asset funds require the investor to underwrite the decision to allocate to a specific asset and monitor developments on an ongoing basis. Active funds appeal to those who believe that market inefficiencies that are worth exploiting might exist and who are comfortable performing due diligence on a manager in the space, often based on a limited track record. Index funds allow for broad-based bets on the market and remove the need for investors to constantly monitor the shifting nature of the space, though they might leave alpha on the table.[62]

Today, private funds are most popular with high-net-worth individuals, registered investment advisers, family offices, and hedge funds.

Approach 3: Publicly Traded Shares

A third and increasingly popular approach among investors is to purchase the seasoned shares of private placement funds via traditional brokerage and custodial accounts, such as Charles Schwab, TD Ameritrade, and Fidelity. These shares are not listed on a national securities exchange, such as the New York Stock Exchange, but, rather, are traded via OTCQX, operated by OTC Markets Group. Shares listed on OTCQX include those of such large companies as Roche Pharmaceuticals and Adidas, as well as those of private placement funds that satisfy certain requirements, including a six- or 12-month seasoning period for shares.

The primary advantage of purchasing shares of a private fund via OTCQX is that investors can access crypto with the same ease and in the same manner that they purchase and sell shares of individual stocks or ETFs. For financial advisers, this has additional benefits, because shares can be held with traditional adviser custodians and reported and managed through traditional advisory reporting software. It also makes investing via an entity such as a trust, tax-advantaged account, or fund simple.

The ease of use allowed by OTCQX, however, comes with a cost: Because new shares created

[62]Bitwise Asset Management, the company for which both authors work, created the first crypto index fund, the Bitwise 10 Crypto Index Fund, in 2017.

through a private placement must season for 6 or 12 months before they can be traded on OTCQX, a disconnect can occur between the number of shares available for trading and the demand for those shares on the OTC markets. As a result, shares can trade at substantial and varying premiums and discounts to their true net asset value. The largest such fund, the Grayscale Bitcoin Trust, has historically experienced premiums and discounts ranging from approximately +140% to −1%. Bitwise Asset Management also recently announced that the Bitwise 10 Crypto Index Fund, the first and largest index fund in the space, is expected to begin trading on OTCQX and to be available in brokerage accounts by the end of 2020.

Today, publicly traded shares are most popular with retail investors, high-net-worth individuals, registered investment advisers, and other funds.

Approach 4: Direct Custodial Relationship

Large institutional investors can access cryptoassets by working directly with a crypto custodian and its trading operation to facilitate the purchase, sale, and custody of individual cryptoassets.

For the right investor, such a relationship can be a very low-cost way to gain exposure to the market, cutting out fund providers and their cost. The logistical challenges here include performing due diligence on the custodian and on the underlying assets and/or strategy, opening and funding accounts, and the existence of separate reporting flows.

Today this approach is most popular with crypto private and venture capital funds, family offices, and certain endowments. It is not available to smaller investors.

Approach 5: CME Futures

The CME bitcoin futures market, along with other nascent regulated futures markets, has emerged as a significant way for investors to access the market.

As with any futures-based investing strategy, maintaining a long-term position using futures involves costs, including the trading costs associated with rolling the position over time. Also, bitcoin futures have historically tended to trade at a modest level of contango, wherein futures contracts trade at a premium to the spot price, which presents a headwind to returns. Futures positions are also taxed differently from direct holdings of cryptoassets, with challenges to deferring the realization of capital gains.

Nonetheless, many investors find comfort in the facts that CME and other futures markets are fully regulated and the custody of futures positions is familiar. CME and other markets also allow individuals to access bitcoin futures using some degree of margin, which might add efficiency from a capital perspective.

Today this approach is most popular with hedge funds and proprietary trading firms.

Approach 6: Venture Capital Funds

Finally, many investors choose to allocate to the space through venture capital firms, which might invest in a mix of established cryptoassets, emerging cryptoassets, and the equity of companies building in the cryptoasset space.

A large number of well-established crypto venture firms from both venture generalists, such as Andreessen Horowitz, and crypto-specific firms, such as Blockchain Capital, have

multiple-year track records and often multiple funds.[63]

Many investors are more comfortable performing due diligence on a venture capital team, as opposed to an entirely novel asset class, and prefer to allow experts to select the best way to gain exposure to the cryptomarket rather than attempt to make those decisions themselves.

On the downside, accessing the top tier of venture capital funds can be difficult for many investors. Moreover, even the best funds have significant fees, and a lack of liquidity can make dynamically sizing the allocation to these funds difficult in a portfolio context. Finally, some people believe that the crypto venture capital space is oversupplied, with too many assets chasing too few opportunities, and that the best investment opportunities are in the past.

Today this approach is most popular with endowments, foundations, pensions, and certain family offices.

Future Approaches

None of the currently available approaches to investing in crypto is perfect. They variously come with high fees, liquidity restrictions, custodial concerns, access limitations, reporting challenges, variable premiums, and other issues.

A solution to these problems would be to package crypto inside an ETF or mutual fund, and a large number of asset managers have been pursuing this idea for years, including most recently Bitwise, VanEck, and Wilshire Phoenix. Exchange-traded products have been approved in certain jurisdictions, including Switzerland, Germany, and Sweden. As of yet and despite efforts dating back to 2013, however, no provider has won approval to launch a crypto ETF or an unfettered crypto mutual fund in the United States. Expectations are that the first such fund, if approved, would hold bitcoin only.

Risk Factors for Crypto Investors

The cryptoasset market is early in its development, and investors accessing the space face material risks. In this section, we examine those risks, classifying them into two groups: risks to crypto as an industry and risks that accrue specifically to crypto as an investment.

Risks to Crypto as an Industry

Eleven years after its creation, the cryptoasset industry is relatively well established, with sufficient critical mass in terms of asset size, institutional support, regulatory development, and other factors to appear to be sustainable in the future. But significant large-scale and even existential risks to crypto that are worth bearing in mind remain.

Technical Risks

Crypto continues to face large technological risks.

Even the most established blockchains, such as bitcoin, are potentially susceptible to bugs and other technical issues that could expose unknown security flaws. As recently as 2018, researchers uncovered a bug in the bitcoin code that, if left unchecked and exploited, could have led to significant (theoretically infinite) inflation in the issuance of new bitcoin.[64]

[63]Disclosure: Blockchain Capital is an investor in Bitwise Asset Management.

[64]Alyssa Hertig, "The Latest Bitcoin Bug Was So Bad, Developers Kept Its Full Details a Secret," CoinDesk (21 September 2018). www.coindesk.com/the-latest-bitcoin-bug-was-so-bad-developers-kept-its-full-details-a-secret.

In practice, that any such bug could have been exploited in a significant manner is highly unlikely. However, the fact that such a bug emerged recently is a reminder that technical flaws are a lingering threat to an asset built entirely on software. Moreover, the threat is likely larger for newer and more complex blockchains.

Beyond these sorts of existential technical risks are incremental performance challenges that could prevent various blockchains from realizing their full potential. Bitcoin, for instance, is currently able to handle only a handful of transactions per second. Although efforts are under way to improve or work around that limitation, it remains a significant bottleneck.

Competitive Risks

Another significant risk is that cryptoasset-powered blockchains will lose out to rising competition from other technological solutions. These solutions could come in the form of improved iterations on distributed databases, improvements to the traditional financial architecture, or other, unanticipated disruptions.

For instance, as discussed, the ability to settle transactions more quickly than the traditional financial services industry is one of the three key technological breakthroughs cryptoasset-powered blockchains offer. But traditional financial services are not standing still. For instance, in August 2019, the Federal Reserve announced plans to launch a real-time gross settlement program called "FedNow" that will significantly speed up financial transaction settlement in the United States.[65] Also, the Federal Reserve announced that it would explore the expansion of its Fedwire Funds Service to run 24/7/365, rather than during banking hours.[66] These and similar advances globally could challenge rapid settlement as a differentiating factor for crypto.

Malicious Noneconomic Actors

Cryptoasset consensus mechanisms rely in large part on economic game theory to exist. The "miners" that validate cryptoasset transactions are incentivized to behave honestly because doing otherwise would be uneconomical.

For instance, if someone wanted to execute fraudulent transactions on the bitcoin network, they could do so if they could amass more computer mining power than the rest of the network combined. This would eventually allow them to "control" the network and dictate the settlement of transactions through what is called a 51% attack (because it requires 51% of the total mining power directed at the asset).

Setting up a 51% attack on bitcoin would cost hundreds of millions of dollars (or more) in installed hardware, millions of dollars in electricity, and nearly impossible logistical processes. Even if it were possible, however, criminals intent on posting fraudulent transactions would never embark on such a scheme because its success would destroy the value of bitcoin, rendering the undertaking unprofitable.

A noneconomic actor, however, such as a state entity, could potentially engage in such an activity. Although the cost would be significant—and would scale if a cryptoasset's value increases—and potential defenses against this type of attack have been built into the code of many blockchains (including bitcoin), it remains a risk.

[65]Federal Reserve Board, "Federal Reserve Announces Plan to Develop a New Round-the-Clock Real-Time Payment and Settlement Service to Support Faster Payments," press release (5 August 2019). www.federalreserve.gov/newsevents/pressreleases/other20190805a.htm.

[66]Federal Reserve Board, "Federal Reserve Announces Plan."

Regulatory Threats

To a large degree, existential regulatory risks to crypto have subsided in recent years. But significant areas of regulatory uncertainty remain for investors to consider, including the following:

- *Asset seizure or bans:* Some worry that the government could ban the ownership of all or some cryptoassets. This concern is particularly acute for cryptoassets that have untraceable transactions, such as Monero and Zcash, because they might raise significant concerns about money-laundering activity.
- *Enhanced AML/KYC requirements:* All cryptoasset transactions are pseudonymous at a minimum. Therefore, to satisfy money-laundering regulations, the crypto industry has been enforcing enhanced AML and KYC requirements at crypto on-ramps, such as exchanges. The further strengthening of these protections could affect the liquidity of the marketplace.
- *Security status:* Cryptoasset exchanges can exist in their current format in part because cryptoassets are not deemed "securities" by US federal regulators. If they were to be deemed securities, the resulting restrictions could severely affect the current liquidity ecosystem. While the "nonsecurity status" of the largest cryptoassets is well established, smaller and newer cryptoassets might have additional risks in this regard.

Additional Threats

An exhaustive list of the threats to the crypto industry is beyond the scope of this paper. However, other areas of concern include the following:

- *Market manipulation:* Cryptoasset trading venues are not as regulated or mature as national securities exchanges or many other financial marketplaces. As a result, they are potentially more susceptible to market manipulation, and such manipulation might be more difficult to monitor and correct.
- *Fraudulent entities:* The history of the cryptoasset industry is beset with stories of fraudulent entities that stole investor money as a result of incompetence or malicious intent. That all investors work with best-in-class partners is critical to avoid the potential for fraud in this fast-moving industry. Investors have lost billions of dollars working with fraudulent or incompetent third parties.

Investment-Specific Risks

Although the aforementioned exogenous and existential risks are important to consider, by far the bigger and more real risks for investors come on the investment side.

Critically, investors must realize that any investment in crypto is likely to be volatile. Crypto is a nascent industry, and cryptoassets have exhibited extremely high levels of volatility, including multiple instances of substantial drawdowns. Although volatility has declined somewhat over time, it remains significantly higher than in traditional asset classes, such as stocks and bonds.

On a related note, this high volatility makes crypto a particularly challenging asset from a behavioral perspective. The temptation to chase runaway returns or sell against falling prices is a common trait in all asset classes, and it might be particularly difficult for investors to stick to a structured investment program in crypto given its exceptionally high volatility.

Additionally, performing due diligence in parts of the crypto space is difficult. Crypto expertise is still developing at consultants, few Wall Street firms provide extensive research on the space, valuation metrics are still under development, and data quality is uneven. Beyond that, many fund managers are new and have limited track records, and those track records might be heavily influenced by the cyclical bull and bear movements.

And, of course, crypto's strong historical returns are unlikely to repeat or could even reverse in the future. Many believe crypto is a bubble, and others, while recognizing its potential, question whether either the space or any particular asset can justify current valuations (much less higher valuations).

Finally, which cryptoassets will emerge as the most important is not clear, nor is how the market will be divided in the future.

The cryptoasset space is a new and evolving market, and its outlook is uncertain, with a wide range of possible outcomes. As with any disruptive, new, and early-stage environment, investors moving into crypto must be prepared for the potential of substantial loss.

CONCLUSION

The goal of this guide is to provide an introduction to cryptoassets: what they are, what they are not, and what they might become in the future.

Our view is that the key to understanding cryptoassets lies in understanding the fundamental idea behind blockchain databases. All the hopes, dreams, excitement, disbelief, and risk that accrue to the cryptoasset space exist because of the breakthroughs that this novel database design provides.

The designer of the first blockchain—Satoshi Nakamoto—created a system that birthed a significant new possibility into the world: the ability to have a distributed database that is controlled by no individual party but maintains a verifiable public record of "the truth." This breakthrough allowed money and other items of value to move onto the internet in a native fashion for the first time and created the possibility of digital scarcity, programmable money, and the rapid settlement of financial transactions between any two parties without the need for a trusted intermediary.

Making this leap introduced trade-offs. Blockchain databases are not as fast as traditional databases, they do not scale as well, they are more challenging to regulate, AML and KYC protections are difficult to enforce, system upgrades and payment protections are challenging to implement, and so on. And as with any new technology, the introduction of blockchains and cryptoassets to the world has been messy, with instances of fraud, overexuberance, scams, and criminal activity.

Despite these drawbacks, the space has grown by leaps and bounds. For early-adopter investors, cryptoassets have been a boon, providing a rare and impactful combination of high returns, low correlations with other assets, and intraday liquidity. Even a small allocation to crypto has had a significant positive impact on portfolio returns.

As we march further into the second decade of crypto's existence, the question becomes, What should we watch for on the horizon?

Will the incredible investment that has occurred in crypto infrastructure—including the development of regulated custodians, the launch of regulated futures contracts, and the creation of

cryptoasset funds—turn crypto into a popular allocation in institutional portfolios?

Will cryptoasset-powered blockchains continue to penetrate their unique use cases, whether that is digital gold, decentralized finance, payments, or other areas?

Will the accommodative stance of regulators continue to progress and develop?

Perhaps most importantly for investors, will crypto's historical pattern of returns persist into the future, or will returns flatten or even reverse?

These are the questions investors and observers must wrestle with in the years to come. We hope that this document has provided a foundation and a framework for doing that.

One thing is for certain: The emergence of a new asset class and financial ecosystem is a rare event, and the potential for cryptoasset-powered blockchains to move the world forward is exciting.

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ARTICLE

Inflation Is Here! What Now?

January 2022

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Key Points

- Inflation is rising rapidly, not an unexpected outcome given governments' pandemic policy response of ballooning deficits and soaring government debt.
- Investors can take steps now to position their portfolios for a high-inflation environment by allocating to value stocks around the globe as well as taking advantage of below-zero real interest rates to finance purchases of real assets, whose prices tend to rise with inflation.

When I started my career in the early '80s, many countries around the world were infected with a miserable inflation disease. Diagnosing the cause of double-digit inflation and administering a cure was the key problem for economists and central bankers. Inflation was ultimately defeated at a significant economic cost—two nasty recessions. Fast-forward the clock by four decades, and inflation is rearing its ugly head again. Is it here to stay and what should investors do about it?

Today's inflation isn't a surprise. Over the past two years, governments have embraced Modern Monetary Theory (MMT) in practice, if not explicitly. To cushion the economic pain inflicted by the pandemic, governments understandably coordinated their fiscal and monetary policies to transfer newly created money directly into bank accounts without raising tax receipts. As I predicted last spring, deficits are ballooning, government debt is soaring, and inflation is spiking.

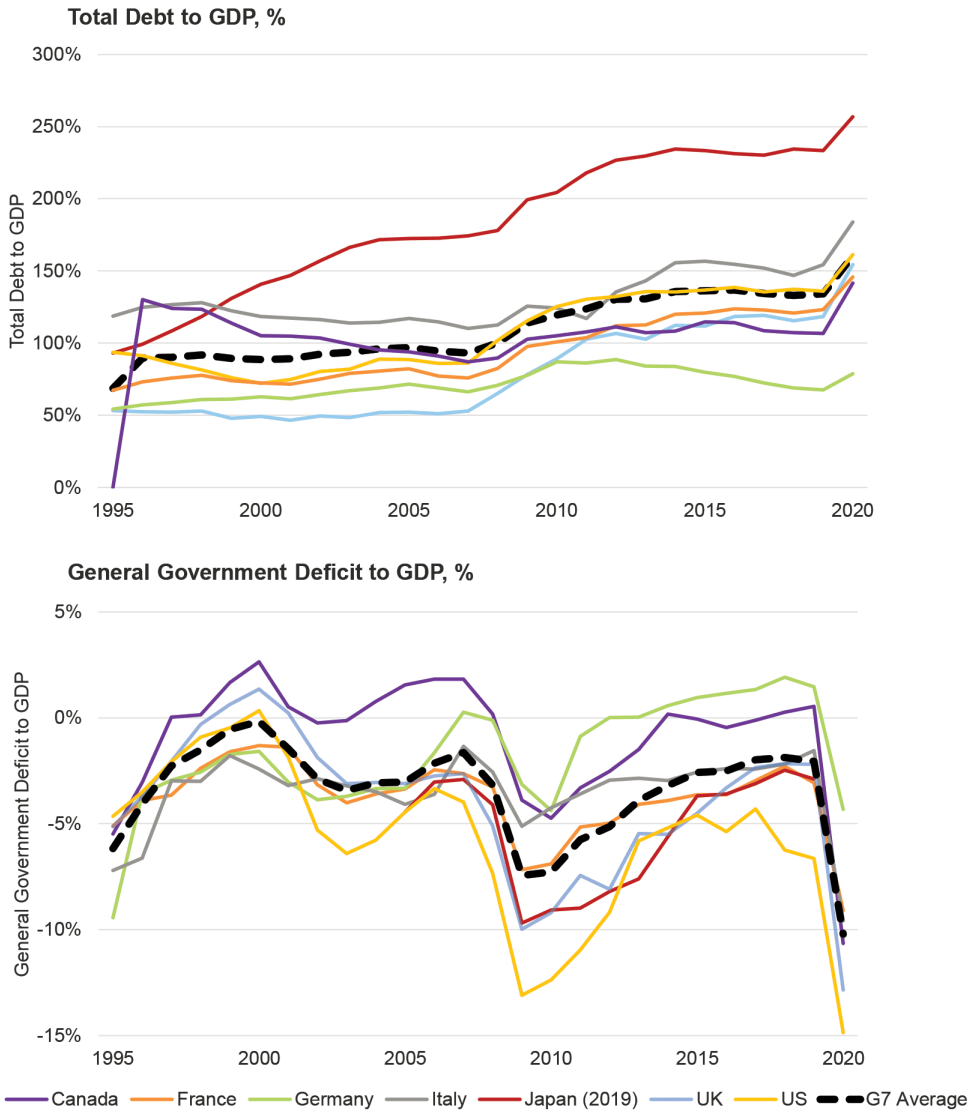
Collectively across the G7 (United States, United Kingdom, Germany, France, Canada, Japan, and Italy) total debt levels as a percentage of GDP have doubled over the last 25 years, jumping from an average 80% in 1995 to over 160% in 2020. Over the quarter-century span, the sharpest annual increase in debt to GDP occurred in 2021, well outpacing the 14% surge during the 2008–2009 global financial crisis (GFC).

Deficits across the G7 have also exploded, surpassing the levels experienced during the GFC. In the 25 years before 2020, the average general government deficit among the G7 was −3% of GDP. In 2021, this ratio spiked more than threefold to −10%, ranging from −4% in Germany to −15% in the United States.

> *"Inflation is political poison because it erodes the real purchasing power of the income of the vast majority."*

Since the pandemic began in early 2020, coordinated fiscal and monetary policies across the G7 nations have led to much higher deficits and debt levels.

Debt and Deficits of G7 Nations, 1995–2020



Source: Research Affiliates, LLC, using data from the OECD, Federal Reserve Bank of St. Louis (FRED), and Internation Monetary Fund.

The situation today, as we begin 2022, is worse than the preceding charts illustrate, because they exclude the huge deficits and massive debt accumulation of 2021. As I explained at the outset of the pandemic policy response, if money printing succeeds in maintaining the nominal value of consumption spending, many more dollars will be chasing a smaller amount of goods and services. The result is inflation.

In the 12 months ended November 2021, US CPI rose 6.8%, registering its sharpest increase since 1982, while inflation in the United Kingdom surged above market forecasts to a 10-year high of 5.1%. Other advanced economies experienced similar inflation highs over the same period. France's year-over-year inflation rate jumped 3.4%, a 13-year high, and Germany's 5.2% inflation rate marked a 30-year high. Japan remains an anomaly with a 0.6% year-over-year 2021 change in the CPI, although higher than in the recent past.

Inflation is political poison because it erodes the real purchasing power of the income of the vast majority. Voters will pressure governments to remedy inflation. What steps are governments likely to take?

Central banks will move to taper their financial asset purchases, but quantitative easing (QE) is not solely responsible for inflation. QE is simply shuffling bank reserves for government bonds on the balance sheets of banks. Worse yet, removing QE could raise the risk of liquidity crises.

Monetary policy alone cannot restore price stability. Raising interest rates is the traditional monetary tool, but central banks are constrained given today's elevated debt levels: the G7's finances cannot afford nominal interest rates above current inflation rates. To effectively tackle rapidly rising inflation, governments must also raise taxes to drain excess demand, just as advocated by MMT. Will legislators nimbly exercise their new responsibility to manage inflation with tax policy? Sustained inflation may be the expedient political path to diminish the real value of excessive public debt.

"Sustained inflation may be the expedient political path to diminish the real value of excessive public debt."

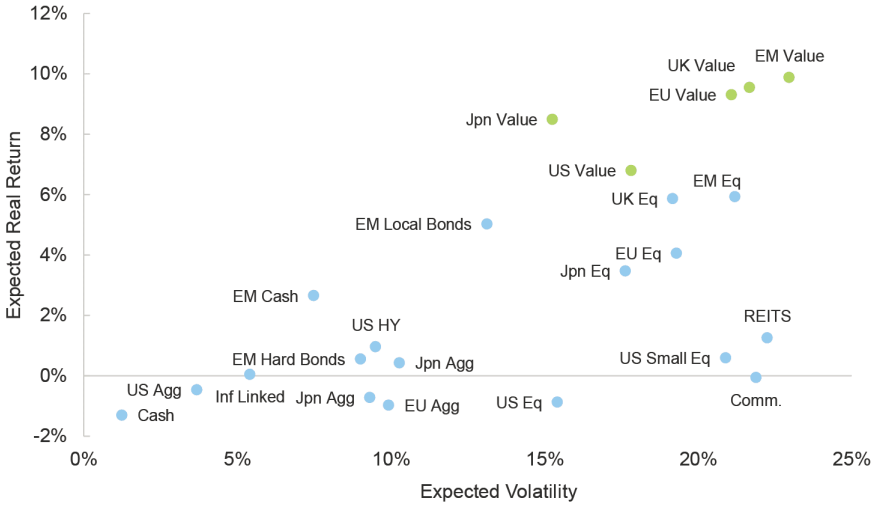
Given this likely scenario, how should investors reposition their portfolios for today's inflationary regime? Informed investors may begin by paring back positions in mainstream stocks and bonds, particularly interest rate–sensitive growth stocks, borrowing at long-term fixed rates, and diversifying into real assets such as real estate, commodities, and resource stocks.

A simple building-block approach, such as the one we use in our Asset Allocation Interactive tool, forecasts long-term buy-and-hold asset-class returns as current yield plus real growth plus likely changes in valuation levels. Without relying on aggressive valuation-reversion assumptions, we are forecasting value stocks to deliver long-term real returns exceeding 6% in the US market and in the 8–10% range for the Japanese, European, and emerging markets. Not only are the long-term return prospects of value stocks around the world attractive relative to the investment opportunity set, they offer exposure to the cyclical sectors of the economy that tend to benefit from reflation. Investors may also want to take advantage of below-zero real interest rates to finance purchases of real assets, whose prices tend to rise with inflation.

"We are forecasting value stocks to deliver long-term real returns exceeding 6% in the US market and in the 8–10% range for the Japanese, European, and emerging markets."

As inflation soars, value stocks around the world offer a safe haven for investors with their outstanding forecasted long-term real returns.

10-Year Real-Return Forecasts for Global Asset Classes, as of September 30, 2021



Note: All data presented herein and on the Asset Allocation Interactive and Smart Beta Interactive websites are estimates and are based on simulated portfolios computed by Research Affiliates, LLC, and do not reflect the performance of any product or strategy. The data are based upon reasonable beliefs of Research Affiliates, LLC, but are not a guarantee of future performance. Forward-looking statements speak only as of the date they are made and Research Affiliates, LLC, assumes no duty to and does not undertake to update forward-looking statements. Forward-looking statements are subject to numerous assumptions, risks, and uncertainties, which change over time. Actual results may differ materially from those anticipated in forward-looking statements. Please refer to disclosures.
Source: Research Affiliates, LLC, using data from CRSP/Compustat and Worldscope/Datastream.

Moreover, investors may wish to prepare for the possibility of liquidity shocks that may accompany central banks' tapering of QE and the coming series of incremental increases in Fed-directed short-term interest rates. Overpriced US assets—in particular, the speculative excesses contributing to the very lofty prices of meme stocks, loss-making electric vehicle companies, cryptocurrencies and non-fungible tokens, and mega-cap tech companies—are most at risk in the current environment.

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